

The AUTOMOBILE

Commercial Section of 1913 Chicago Show Breaks All Previous Records

Seventy-Six Truck Makers Exhibit Their Product on Vast Floors of Coliseum, Armory and Wilson Building

CHICAGO, ILL., Feb. 10

—The commercial vehicle section of the Thirteenth Annual Chicago Automobile Show was thrown open to members of the trade at 10 o'clock this morning and to the general public at 2 o'clock this afternoon. By the time the crowd had begun to press through the doors of the Coliseum and the Armory practically every exhibit was in place. There are seventy-six makes of commercial vehicles exhibited and 141 accessory booths. The trucks fill the main floor of the Coliseum, the Annex and the Wilson building as well as that of the First Regiment Armory. In the Coliseum thirty-six different makes of vehicles may be seen, in the Annex there are nine, in the Armory twenty, and in the Wilson building eleven. The accessories are shown in the gallery of the Coliseum, on the second floor of the Annex, and in the gallery of the Armory. The basement of the Coliseum, which was used for both cars and accessories during the pleasure car show, has been abandoned this week, the floor space occupied by the truck section being only 135,615 square feet as compared with 147,990 square feet required for the passenger vehicles. Sixty-seven of the commercial vehicles on display are

Impressions at the Chicago Show

¶ *An offspring of the passenger car business, the commercial vehicle industry, has shown itself exceedingly precocious. In its early days no one paid much attention to its increasing stature and trucks were included in the passenger car exhibitions in a sort of tolerant way, almost as accessories.*

¶ *All this has been changed and changed very radically. For several years commercial vehicles have been recognized as products of an independent industry big enough and strong enough to take care of itself as such. Truck shows are held in conjunction with the passenger car exhibitions instead as a part of them.*

¶ *The show now in progress at Chicago typifies in its exhibits the common sense ideas which are coming into control in the motor truck field. The freak constructions are being eliminated, standardization is being broadened in scope and the result is a more highly finished and efficient product.*

¶ *One of the salient features of the present Chicago truck show is its wide scope. Here may be seen trucks of all sizes, from the little 500-pound delivery wagons to the tremendous 7 and 7.5-ton vehicles, massive and powerful as the mammoth or the mastodon, but infinitely more useful. The favorite sizes, however, judging from the exhibits, are the 2, 3 and 1-ton vehicles in the order named.*

¶ *Many men of many minds may well be suited in the selection of a type of body adapted to each particular line of work for there is a great variety on exhibition. There are dumping bodies of varying sizes to suit varied requirements, power or manually operated, as the buyer wills. There are all sorts of transfer bodies for all kinds of delivery service. In fact, the prospective truck buyer will be hard to suit who cannot find what he wants at the Chicago show.*

of the gasoline type the other eight being electrics. At the recent New York show there were six makes of electrics shown but only fifty-nine makes of gasoline machines. The value of the truck and accessory exhibits is estimated at \$1,000,000.

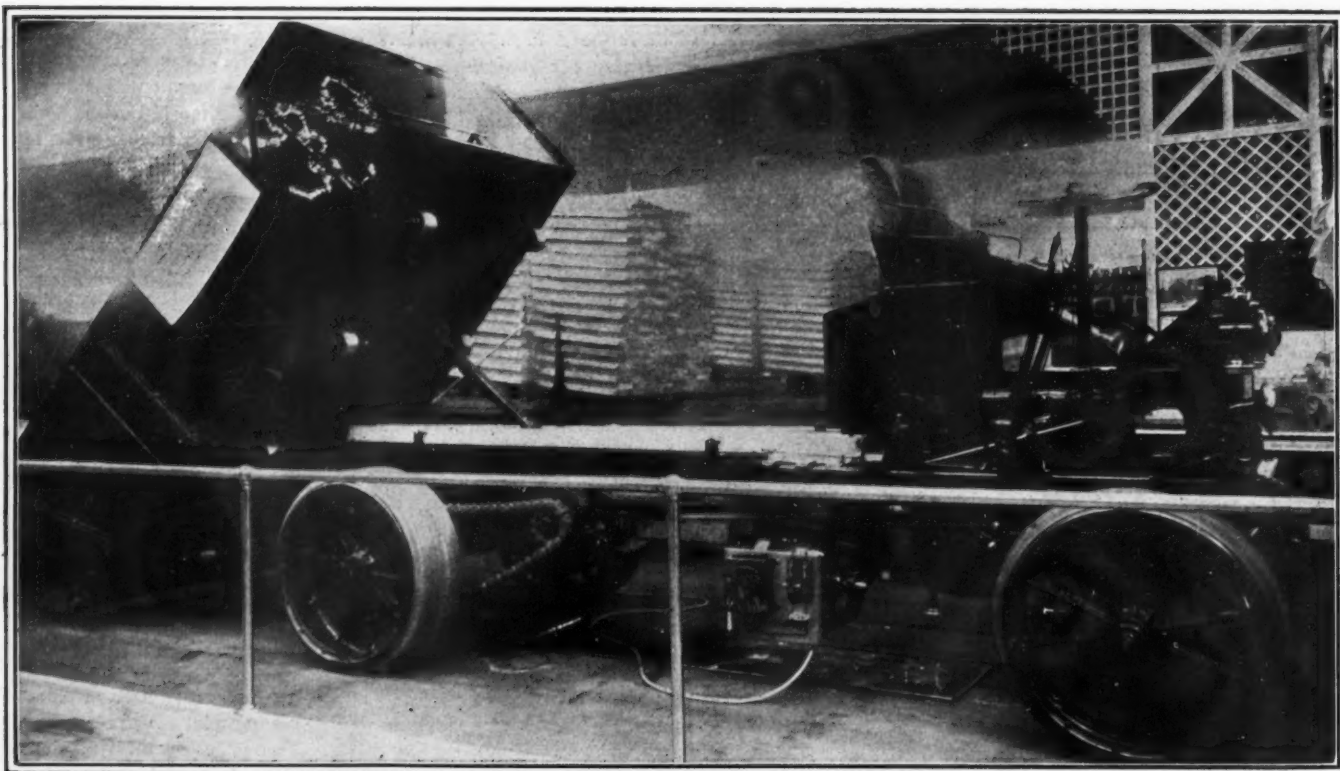
There are nineteen makes which did not appear at the New York exhibition. These are: Adams, Avery, Buffalo, Clark, Commerce, Diamond T, Four-Wheel Drive, Harder, Harwood-Barley, Harvey, Ideal, Mercury, Mogul, Natco, Old Reliable, Poyer, Rambler, United States and Urban. Naturally a considerable number of makers who had space in New York are not represented in Chicago. A few of the Chicago exhibitors are showing parts as well as chassis and complete trucks. Among these are International and Mais.

The decorative scheme used during the pleasure car week is continued throughout the commercial car section the only change being in the names of the various exhibitors and the arrangement of the spaces.

Quick action characterized the transformation of the pleasure car section into the commercial vehicle section. Promptly at closing time on Saturday night the pleasure cars and such accessories as did not exhibit during the second



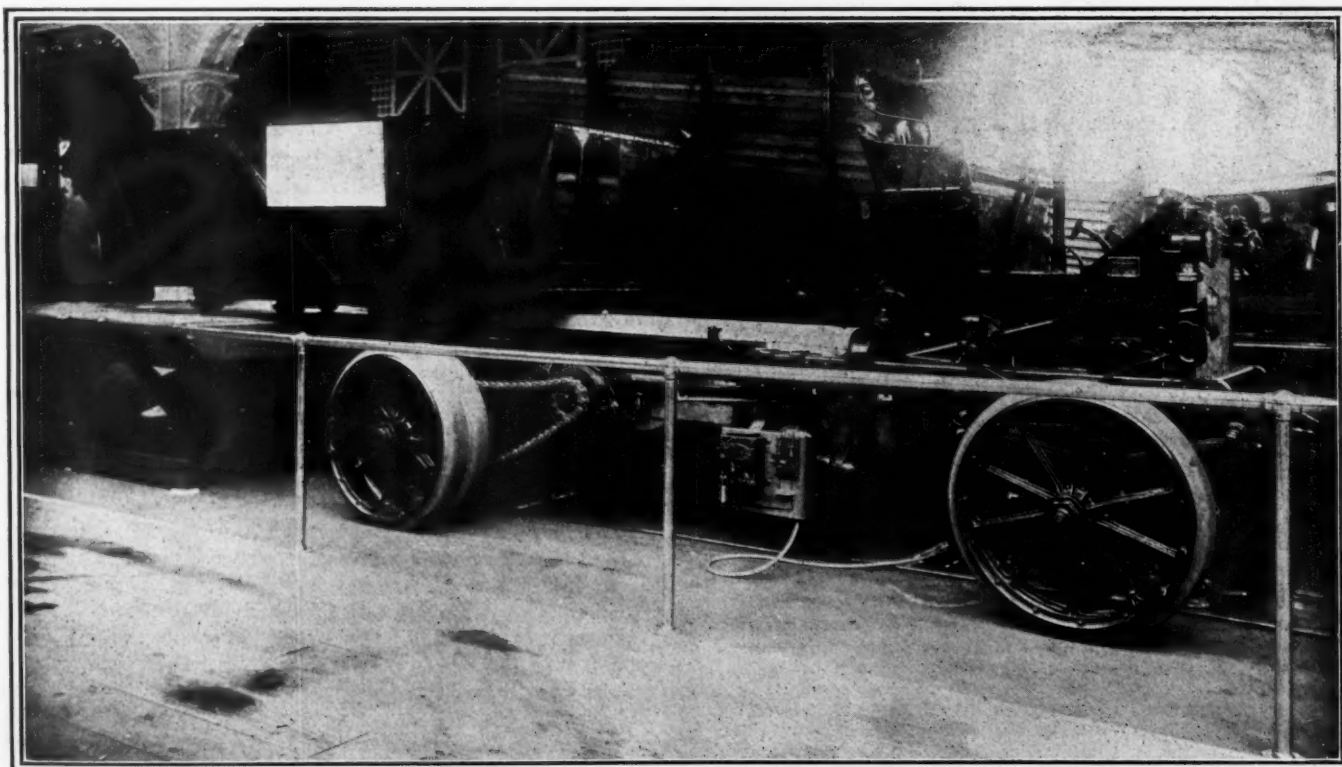
Interior of the Coliseum at the opening of the second week of the automobile show, when commercial vehicles reigned supreme, showing wide central passage which made a review easy



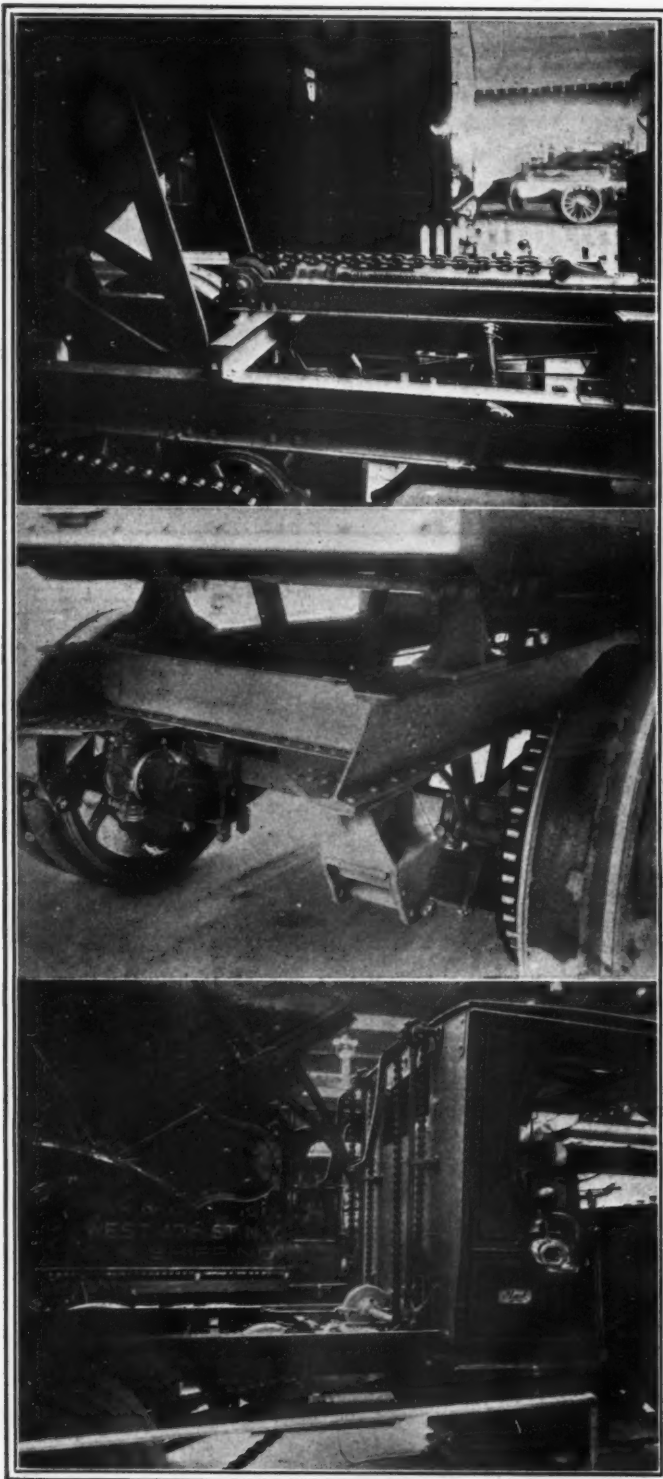
Locomobile 5-ton truck with automatic dumping body designed to dump at an angle of 55 degrees, constructed for heavy materials such as sand, coal and other similar substances



Center of the Coliseum, showing the arrangement of trucks on the floor of the exhibition hall, with ample space between them to allow of inspection by visitors to the show



The 5-ton Locomobile automatic dumping body is actuated by an endless screw, and rollers tilt the body to the proper angle, holding it against the rear edge of the chassis



Two Dumping Bodies at the Chicago Show

The new White power dump body is operated by a nut traveling on a long endless screw extending along the center of the chassis from the back of the seat to above the jackshaft. To the traveling nut is attached two stout chains which pass over respective pulleys and attach to a V-shaped framework fastened to the underside of the body floor. As the traveling nut is carried forward on the endless screw the body is raised and traveling towards the rear allows the body to lower onto the frame. Automatic means are provided to cut out the power and stop the endless screw when the body reaches either the raised or lowered positions.

The Mack dumping body is operated by power of the motor. The mechanism consists of two vertical chains passing over upper and lower sprockets in rear of the driver's seat. Attached to a link of each chain is a link which also connects with two arc-shaped feet on the under side of the body. Driving the chains in one direction raises, and in the opposite direction lowers the body.

week were hurried into shape for removal from the buildings. Electric wagons were used for hauling the cars out of the building, the action thus being continuous, one electric going out at about the same time the other came back for another car. By 8 o'clock in the morning practically every vestige of the pleasure car show had been removed and the electricians began to move the trucks in. They were busy at this task until Sunday afternoon, when most of the exhibits were in place. A few spaceholders were late in sending in their exhibits but these were practically all in place by opening time today.

The largest exhibits at the show were those of the Packard, White and G. M. C., each of which comprised eight vehicles. The Alco showed seven trucks and a trailer, and the International also showed seven machines. There were six exhibitors represented by one truck or chassis. The greatest number, however, exhibited three vehicles, although nearly as many exhibited two. Four machines were shown by a few more exhibitors than showed five.

The preponderant class at the show were of 2-ton capacity, although the 3-tonners ran them a close race followed by the 1-ton vehicles. The range varied from 500-pound capacity vehicles to 7.5-ton trucks.

One of the distinguishing features of truck design as exemplified in the vehicles exhibited at the Chicago show seems to be that of making the vehicle suitable to the work to be done rather than trying to make the work accommodate itself to the vehicle. This, of course, is shown more in body design and special fittings than in the chassis proper.

Special bodies for special services are coming to be the rule rather than the exception as they were formerly.

All are not like this, however: On a mercury wagon the driver occupies a single folding seat, the width of which is not more than one-third that of the body. He sits on the right side with the side door immediately in front of him. There are rear doors which are kept locked when delivering and are only used for loading. At the left of the single seat is an open space giving free access to the entire packages carried.

The Willys utility wagon, an express type with canopy top, is made to afford every facility for loading and unloading. It has a hinged side door at the right immediately back of the driver's seat. The tailboard is hinged and provided with chains to hold it at a practically horizontal position.

With small capacity vehicles for light package delivery work it is expected that the use of compartment for carrying fragile packages would be resorted to; and also that shelving hinged to the sides would come into more general use. Little is shown in this respect, one of the few examples, however, being the Menominee with shelving which practically increases the carrying capacity 100 per cent.

Open express wagons are perhaps shown in greater numbers than in any other type of vehicle as they are suited for so many lines of work such as grocery, express, produce, etc. There are a number of furniture models of the van type but they are practically standard in construction. They all use the padded rail to protect the furniture, one or two are made without side pillars between the wheels so that the load can be taken off from the right. This is most important for use in large cities with narrow streets, where there would not be sufficient street widths to back the truck up to the curb as is necessary for rear unloading.

The Clark delivery wagon is similarly designed for lumber trade, and has a flat framework extending forward at either end of the seat and at either side of the motor forward to the radiator. This allows of carrying practically any length of timber at either side with shorter lengths back of the seat. The flat framework extending forward alongside of the motor, serves as a fender for the front wheel, and beneath this framework and between the wheels is space for a large box for carrying tools, etc.

Another combination wagon which offers a wide field for usefulness, is the White combination farm wagon. It is an express type of body with canopy top. Two removable cross seats

are shown in place in rear of the driver's seat. These are removable when produce or freight is to be carried. The vehicle is fitted with pneumatic tires.

As usual there is a big exhibit of dumping bodies suitable for all coal, sand, and gravel work. The use of the engine power for dumping these is becoming general, whereas a year ago, but few used such. The Pierce-Arrow and Kissel show hydraulic dump types; on the Locomobile an endless horizontal screw with traveling nut is used for the dump body and also for the removable body which is supposed to be placed on a standing platform. The Mack shows its motor-driven, chain-type dump and the Packard and Universal also show dumping types.

The types of bodies suitable for building construction trade are in greater numbers than ever before, a fact which demonstrates the interest this class of buyer is now taking in the motor vehicle. The Locomobile shows a quick-unloading lumber body. On the Mogul use is made of transverse steel rollers on which either a body or heavy building timbers can be rolled on or off.

There are not so many tank wagons for the oil trade as have been seen in other years due largely to the fact that oil concerns have adopted their standard body types and their business is largely repeat orders. The Avery company shows a large tank type with a commendable four-compartment cabinet at the rear end with hinged doors. These compartments contain the faucets in the lower part, and spaces for the tanks and other necessities in the upper. Along either side of the tank is a platform with iron railing, not unlike that along either side of a locomotive boiler for railroad work.

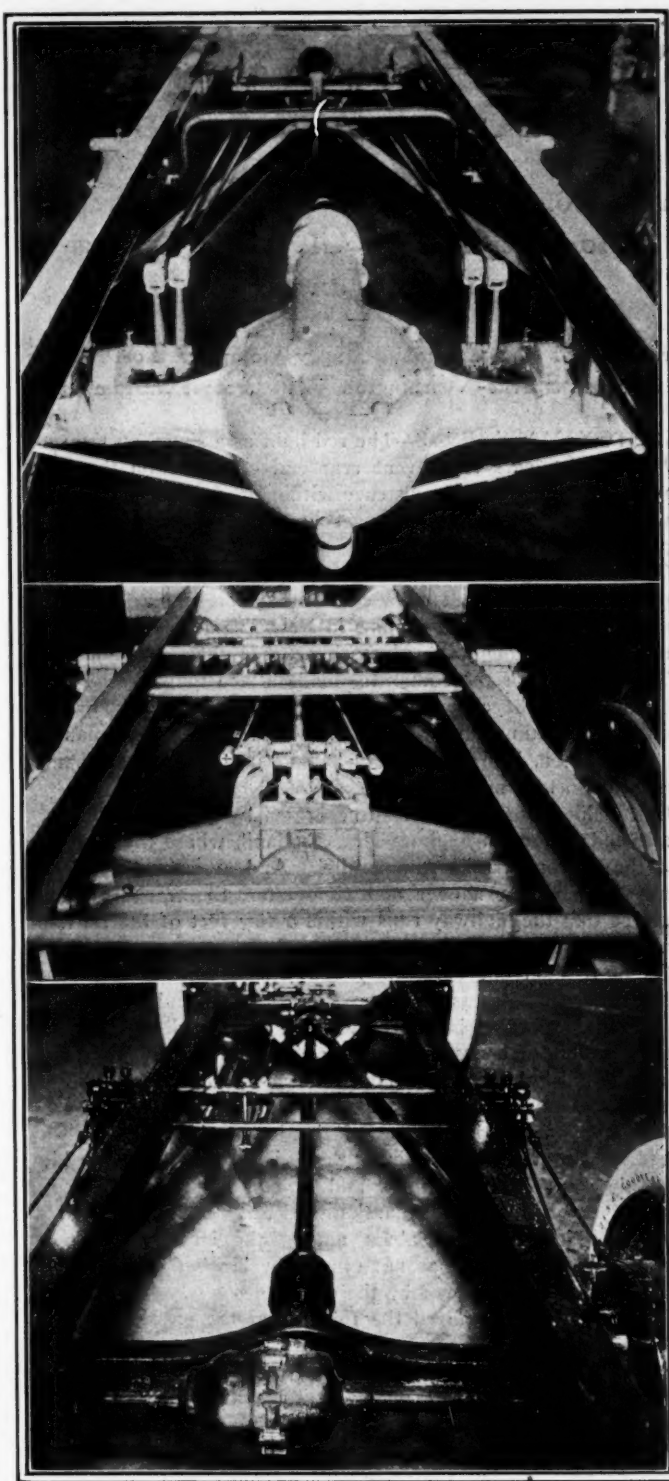
The fact that concerns are insisting upon standard body styles for their industry no matter what make of truck they may use is well shown in the three body types of the Schultz Bread Company. These are on three different chassis, a White, Walker electric and General Vehicle electric. The body designs are alike and are characterized by zinc flooring for cleanliness, and by a side door immediately in rear of the driver's seat, and on the right side of the vehicle. There are large rear doors but they are only used for loading purposes.

Another example of special body for the service is that of a florist wagon used for a 5-mile haul with a stop at each end. Rear doors only are used and the body is of a size to accommodate the packages most used by the concern.

There are fewer fire department vehicles than seen at any previous Chicago motor truck show. Not a few of the concerns prefer standard transportation trade to the fire department field which is so largely special order work to specifications drafted by the various municipalities. If sales of fire department vehicles are general on tender and are supposed to go to the lowest bidder, a fact which causes many makers to prefer confining their efforts to standard types of trucks for industrial fields. The fire department vehicles shown are manufactured by the White, Federal, KisselKar and Pope-Hartford companies.

The use of the trailer is well evidenced by the Knox company, which shows the Martin-Knox tractor pulling a large tank for oil purposes, and on another tractor is mounted the forward end of a body suited for the ice industry. This concern is now supplying the three-wheel tractor for practically all industries. The new Garford tractor is a four-wheel type which carries a horizontal fifth wheel on which the forward end of the trailer body rests.

The Chicago is well represented in the light delivery wagon field, but in all of the bodies shown there is a deplorable lack of versatility of interior arrangement. Some of these designs are open to every criticism in that not a solitary effort has been made to save time by facilitating the arrangement of packages or securing them by the driver or jumper boy when making house-to-house deliveries. There are several of them in which the driver's seat extends across the entire front of the body with a partition from the top of the seat to the roof so that it is necessary to walk to the rear doors in order to get any package, no matter if the package is lying immediately in rear of the driver's seat.



Three New Axles Seen at the Chicago Show

Worm-driven axle on new 1-ton Universal truck. The worm and worm wheel are assembled as a unit in the cover part of the axle housing to facilitate ready removal.

Combined live and stationary axle on new Studebaker trucks. The stationary axle is an I-beam piece, in front of which is carried the jackshaft portion. The ends of the jackshaft carry spur pinions which mesh with enclosed spur gears on the road wheels. It is possible to get any desired gear reduction between these pinions and gears so that the bevel gears in the center of the jackshaft construction are nearly the same size, giving a reduction of approximately 1.25 to 1. Note the radius rods which converge at their forward ends and attach to a frame member.

The small Brown delivery vehicle uses a combination stationary and live rear axle with the stationary portion in front. The live axle portion, or jackshaft portion, carries a spur pinion at each end for meshing with a spur gear on the road wheel.

Red Tail Light Menace to Railroad Employees

Alco Company Denies Reports of Segregation Into Parts—Cleveland Wants Better Tax Law

Creditors of the Columbus Buggy Company To Preserve Assets—Sparks-Withington Will Protect Customers

BOSTON, MASS., Feb. 8—The red light as a signal on the rear of motor cars to prevent rear end collisions on the road may be legislated out of existence within the next few years because of their being really dangerous to the operation of railroad trains.

That these lights have already caused trouble has just been brought out as a result of a committee representing the locomotive engineers operating trains in New England having sought some remedy through the Massachusetts Highway Commission.

The members of the committee made a plea that the red light on motor cars be changed to white or some other color not used in railroading and when Col. W. D. Sohler, chairman of the commission, heard what they had to say, he realized that it was an important matter.

Col. Sohler was told that there are many places in the Bay State, and in fact throughout New England, where the highway and the railroad tracks run parallel. And at some places, for example up near Andover and Gloucester, the tracks make a curve so that the highway runs within a few feet of the railroad roadbed.

On more than one occasion, it was stated, an engineer coming around a curve has seen a red light ahead, and jammed on his emergency brakes bringing the train to a quick stop, jolting the passengers of course, only to see the red light moving away, being the tail light of a motor car instead of a danger signal on the railroad tracks.

This has happened to some of the important trains, it was stated. Of course to an engineer the red light coming upon him suddenly out of the darkness and in close proximity left no alternative but to take precaution and after this happened a few times it got talked about among the engineers. So it seems that the matter was not one to be laughed about, but a real serious menace viewed by these men.

President Speare realized the fairness of the engineers' point of view, more so because motor cars are becoming far more numerous now and owners are making longer tours and are not afraid of using the highways at night. Colonel Sohler suggested that perhaps the Massachusetts State A. A. might introduce a bill in the legislature to change the color of the light to white, or anything but red or green.

Ohio Legislature Busy

COLUMBUS, O., Feb. 10—A bill introduced in the Ohio General Assembly to compel motormen of interurban cars, while passing motorists, to screen their glaring headlights was defeated recently after it had been reported out by the committee favorably. The Columbus Automobile Club fathered the measure and the members were much disappointed at the defeat.

Senator Lloyd, of Franklin County, has introduced a bill in the Ohio Legislature providing that motorists after running over or colliding with an individual must apply the brake at once and go to the aid of the injured. Failure to comply with the law is punishable by a fine of from \$200 to \$500 and imprisonment of 30 days to 6 months.

Senator William A. Weggandt, of the Ohio Legislature, is

drafting a bill to have the state sell the abandoned canal lands and to have the money, received from the sale of the lands applied towards the improvement of the highways of the state. The matter has been taken to Governor Cox for his approval. It is believed that at least \$20,000,000 would be realized from the sale of the abandoned canal lands.

Alco Not To Split Into Parts

In a statement relating to the future of the automobile business of the American Locomotive Company, President W. H. Marshall, of the company, denied the reports which have been circulated recently with regard to this subject. These reports hinted that the automobile departments were to be incorporated as a separate company from the locomotive manufacturing concern, with separate officers, etc. According to Mr. Marshall, these reports are entirely unfounded. The automobile department will be continued as heretofore, as part of the principal organization, and under the special supervision of Leigh Best, vice-president of the company, who will take over this work in addition to his other duties.

J. W. Du B. Gould, whose arrangements with the company have been announced in last week's issue of THE AUTOMOBILE, is going to increase the operating efficiency of the company's automobile factory, applying the principles of scientific management to this end of the business. No sweeping changes of any nature are being looked toward, at least for the present.

Try To Preserve Columbus Assets

COLUMBUS, O., Feb. 7—A meeting of the creditors of the Columbus Buggy Company, of Columbus, O., which has been in the hands of Daniel McLarin as receiver for several weeks, was held Friday, February 7, at the office of Attorneys Sater, Seymour & Pease. The object of the meeting was to discuss ways and means to preserve the assets of the company. Many of the holders of the preferred stock of the company attended the meeting.

Cleveland Protests Against Tax

FINDLAY, O., Feb. 8—Complaints from the larger cities of the state are being made to Governor Cox relative to the proposed increase in the state license fee for automobiles. A committee of Clevelanders visited the governor a few days ago to protest against any change in the law unless there would be some compensatory changes that would interest the auto owners of the large cities. It is said that Cleveland pays one-fifth of the state auto license tax, and the county gets back but one-eighty-eighth of the fund. Under the increased fee proposed the total license fees from Cleveland would be about \$180,000, while the county would have returned to it for road improvement about \$10,000. If the proposed fee is imposed they want it pro rated to the counties on the basis of payments.

Sparks-Withington To Shield Clients

The Sparks-Withington Company, Jackson, Mich., who recently was sued by the Lovell-McConnell Manufacturing Company, Newark, N. J., for alleged infringement on the Klaxon patents, has announced that it proposes "to protect all our customers against any suits that may be brought against them to frighten on account of using Sparton horns."

Cannot Sell Perry Chains

CHICAGO, Feb. 6—The Parsons Non-Skid Company, Ltd., and the Weed Chain Grip Manufacturing Company yesterday secured a temporary injunction in the United States District Court against Emil J. Crimske, individual members of the E.Z. On Chain Tire Protector Company, and Hartley Manufacturing Company, Manufacturers' Auto Tire Company and the Whitaker

Manufacturing Company restraining them from disposing of the stock of chains made by the Perry Chain Manufacturing Company, of Lansing, Mich., which they have in their possession. It is claimed that the Perry chain infringes the Parsons patents with the exception of a wire spring, which, it is said, is so frail as to be easily broken off; which, it is alleged, makes a Weed chain out of the Perry device that closely resembles the Weed.

Indiana Kills Hughes Bill

INDIANAPOLIS, IND., Feb. 10—Hope of obtaining good roads legislation at the present biennial session of the Indiana legislature has vanished. The House, by a vote of 79 to 13, has killed the Hughes good roads' bill, which was drafted by the Indiana Good Roads Association and indorsed by numerous organizations. It was also the administration good roads measure. The bill provided for the creation of a state highway commission and would have prevented farmers from working out their road taxes. It was the sentiment among the farmers against the bill that killed it.

One Mill Tax for Minnesota

W. H. Campbell, of New York, member of the good roads board of the Associated Motor clubs, is in St. Paul and Minneapolis pushing the good roads propaganda. The 1-mill tax amendment to the constitution was passed at the last election and the legislature is about to take up the consideration of how much of the tax will be ordered into effect. The mill is the maximum and the legislature may decide upon the limit of assessment for the next 2 years up to that amount. This full tax can produce about \$1,000,000 a year. The bill for which the good roads people are working now has been introduced by R. C. Dunn, promoter of the mill tax, to centralize supervision policy, set aside a percentage for maintenance, and to build roads that will last. The bill divides state aid into four classes based on assessed valuations of counties. The counties with the lowest valuations are to be allowed 80 per cent. aid. The minimum is 50 per cent.

Indianapolis After Jay Walkers

INDIANAPOLIS, IND., Feb. 9—A rigid enforcement of the city traffic ordinance has been started in Indianapolis by the police. Although the ordinance has been in effect 2 years it has not heretofore been enforced against pedestrians. Under the present enforcement, pedestrians are permitted to cross the street only at right angles, and not diagonally.

Paul Smith Now with Lozier

DETROIT, MICH., Feb. 10—Paul Smith, formerly with the Flanders Motor Car Company, has become connected with the Lozier Motor Company, of this city, in the capacity of manager. He will co-operate with Harry M. Jewett, president of the company, in evolving a big, efficient distribution campaign for the product of the Lozier works.

Roth-Murphy in Trouble

INDIANAPOLIS, IND., Feb. 10—Maynard E. Zepp, an employee, has brought suit in the circuit court asking that a receiver be appointed for the Roth-Murphy Engine Starter Company of this city. Zepp says the company is indebted to him for work, that he owns several shares of stock and that the company has \$32,000 worth of capital stock outstanding.

Norwalk Declares Good Dividend

MARTINSBURG, W. VA., Feb. 10—The directors of the Norwalk Motor Car Company, Martinsburg, W. Va., have declared a dividend of 7 per cent. which is payable now.

Pennsylvania Road Report Now Ready

Bull Purchases Grabowsky Plant—Randolph Assets Exceed Liabilities—Midland Increases Capitalization

Delaware Laws Proposed to Inforce All Vehicles to Carry Lights—Fractional Year Law Also Provided

YORK, PA., Feb. 8—E. M. Bigelow, Pennsylvania state highway commissioner, submitted to the House of Representatives last Wednesday a statement of the work of his department, during the session of the legislature now convening at Harrisburg.

The report shows an expenditure of \$4,401,413.24 from June 1, 1911, to January 1, 1913. The department has a balance of \$1,221,667.82 on hand. Of the general state highway appropriation of \$3,000,000, \$2,943,982.22 was expended for repairs, construction, surveys, maintenance, etc., leaving a balance of \$56,017.78. In addition to this there is in the state treasury, \$1,845,780.31, representing the receipts from automobile licenses. For state-aid roads for which the legislature of 1911 appropriated \$1,000,000 the department has expended \$151,562.57, leaving a balance of \$848,437.43. Under the state-aid acts of 1907 and 1909 the department has had available during the period of this report, \$660,642.28 remaining from former appropriations and \$345,438.78 returned by counties and townships, a total of \$1,006,081.06, of which \$906,233.02 has been expended, leaving a balance of \$99,848.04. The appropriation for the National or Cumberland road, amounting to \$300,000 has been expended to the extent of \$173,748.22, the balance on hand being \$126,251.78. Of an experiment fund of \$50,000, \$24,276.95 was used, \$25,723.05 remaining. The traveling expense fund of \$88,000 was all used except \$4,202.38. Out of the contingent fund of \$79,000 the department expended \$2,759.31, leaving a balance of \$50,240.69. The appropriation to the automobile division was \$100,000 and the expenditures \$89,053.33, the remainder being \$10,946.67.

Randolph Bankruptcy Not Justified

CHICAGO, Feb. 8—Affairs of the Randolph Motor Car Company were aired before Federal Judge Landis today when E. Goldman, president of the concern, took the stand and accused two former employees with wrecking the concern by taking action in bankruptcy when they had no just claims. The two salesmen claimed \$1,300 was due them in commissions. The assets of the company are placed at \$100,000 by the concern's attorney while the liabilities are said to be \$65,000.

Take Grabowsky Plant to Detroit

DETROIT, MICH., Feb. 8—The Edward G. Budd Manufacturing Company, of Philadelphia, is the real purchaser of the Grabowsky plant and will remove here with its entire office and manufacturing forces. The Budd company is a manufacturer of pressed steel bodies and when it locates here it will increase the capacity of the Grabowsky plant by 300 per cent.

Midland Increases Capital

MOLINE, ILL., Feb. 9—Stockholders of Midland Motor Company met last week and authorized advance in capital stock from \$100,000 to \$300,000. The increase is made necessary to permit carrying out a policy of expansion, aim of the company being to turn out 1,000 cars during 1913. All of the \$200,000 additional stock has been subscribed.

Delaware Laws More Strict

WILMINGTON, DEL., Feb. 10—Two bills are pending in the Delaware Legislature which are of interest to motorists. One requires all vehicles on the roads and streets to carry lights at night and the other proposes the issuance of fractional licenses where persons buy cars during the latter part of a year.

States Give Good Roads Much Needed Attention

Canada Wants Good Roads— Connecticut Passes Improvement Bill

Automobile Laws in Various States Revamped— Minnesota and Connecticut Make Changes

HARRISBURG, PA., Feb. 10—Among the measures introduced at the session of the Legislature at Harrisburg this week is a bill to amend the state highway law. It provides that in the case of the highway commissioner deciding to take over a toll road he can do so before the damages have been fixed by the process of law. Under this bill the state can go ahead and make improvements and remove the toll gates before the courts have determined the damages the owners shall have. Another gives cities and boroughs the power to improve roads less than 1 mile beyond municipal limits, and the other levying a 1-mill tax for highway construction and maintenance in townships, the money to be distributed by the state highway commissioner.

May Change Minnesota Law

MINNEAPOLIS, MINN., Feb. 9—Prospects are good for a change in the automobile license law of Minnesota which now calls for a tax of \$1.50 a car for 3 years' running. A horsepower tax bill was introduced, but met the opposition that it might be unconstitutional as taxation in Minnesota must be on an equal basis for all classes of property. The tax was to be in lieu of all assessments. Automobiles are now placed on the personal property tax lists. With the \$10 tax the machines will be still subject to personal property tax. The license fees would be applied to roads. On the horsepower tax it is estimated \$750,000 a year would be raised. The \$10 tax would net about \$500,000.

Want Iowa Highway Commission

DES MOINES, IA., Feb. 10—The sub-joint committee of the Iowa House of Representatives which is to present a good roads bill for adoption by the present Legislature has about decided on its program, and it is thought the bill will be presented to the House by February 15. As outlined now the bill will provide:

Establishment of a state highway commission of three members, with ample authority, these commissioners to select a highway engineer.

County engineers for every county in the state, to be employed by supervisors.

Classification of all highways into county and township roads.

All money expended on county roads to be in line of permanent work. No money to be spent except on approval of engineer.

Two mill levy to be placed in compulsory drag fund to be paid out only by superintendent of township roads.

A separate feature of the bill will provide for a 1 mill levy for state aid to be raised from all taxable property in the state, including all property in cities, but this money is to be used only on country roads for permanent highways.

Changes in Connecticut Law

HARTFORD, CONN., Feb. 8—Albert Philips, recently elected secretary of state has spent much of his time since assumption of the office in a revision of the Connecticut automobile law passed by the legislature 2 years ago. Automobilists do not care to see this law set aside for something else, but the secretary has some ideas of his own on the subject expressed in the revised law which has been brought to the attention of the Senate by Senator Johnson, of the Twentieth District.

An important change made by the secretary of state is the taking away from the town assessors the right to tax auto-

mobiles. The new bill provides that the owner shall pay at the time his vehicle is registered for the year, 10 mills on the value of the car at 75 per cent. list price for the first year, 55 per cent. of the list price for the second year, 35 per cent. for the third year and for the fourth and each succeeding year, 20 per cent. is to be charged.

Another change proposed affects commercial cars registered in other states. During the past 2 or 3 years much freighting has been done in Connecticut by New York and Massachusetts registered trucks. New York City cars are frequently seen in Hartford.

At present a foreign or outside registered motor truck is not compelled to bear a Connecticut license. The new secretary's bill provides that trucks operated more than 10 days in a year in this state shall be registered. This little piece of legislation is aimed at moving vans and the like.

Prevent Misuse of Dealers' License

DES MOINES, IOWA—In a bill in the House of Representatives it is provided that automobile dealers shall report sales and contracts for sales to the secretary of state. This is designed to prevent automobile owners from operating machines 3 to 6 months after purchase without taking a license. The author of the bill says hundreds of new owners run their cars for months under dealers' license. If the new bill is made a law the secretary of state will be able to collect the tax at once. Another bill provides that every dealer have a license number for each car which he is operating outside his place of business, instead of a general license number. A third bill provides that a car purchaser may get a license from the secretary of state for the unexpired time in the year, for half price. The present law requires payment of full amount no matter how much time remains.

Improving Connecticut Roads

Passage of a bill introduced in the state legislature will provide for a bond issue of \$5,000,000 for the improvement of trunk line highways in Connecticut.

Connecticut Registrations High

HARTFORD, CONN., Feb. 8—Twenty-seven per cent. more cars were used in Connecticut in 1912 than the year previous, or 17,900 were registered as against 14,000 in 1911. Revenue from motor vehicle registration in Connecticut during the past season amounted to \$255,124, or an increase of about 11 per cent. over the year previous. The receipts for 1912 represent in addition to private owners 10 manufacturers, 389 dealers, 25 motorcycle dealers, 486 livery cars, and 26,241 operators.

Comparison of cost of operation of the registry departments of the states of New York, Massachusetts and Connecticut is interesting. It cost New York state 16.2 per cent., Massachusetts 14.7 per cent., and Connecticut 5 per cent. of receipts to collect fees. These figures represent net office expenses exclusive of cost of markers or license plates.

Approximately \$255,000 was expended in 1912 for Connecticut road improvement.

According to the above figures emanating from the secretary of state's office motorists in Connecticut contributed more than a quarter of a million dollars to operate their cars.

Canada Wants Good Roads

ST. JOHN, N. B., Feb. 10—At an enthusiastic convention of delegates from all over the province here last night, a Provincial Good Roads Association was formed, and resolutions were passed strongly urging the government to take the roads out of politics and to provide for three trunk lines stretching across the province from the Maine border; to abolish statute labor, and to provide for a patrol system; also to appoint a competent engineer under whom all road work would be carried on.

New Indianapolis Race Entries of Last Week

Root Succeeds Wagner as Starter— Several Additional Entries Assured

**Albert Guyot with a Sunbeam Racing Car
Has Sent His Entry In—Third Stutz Entered**

INDIANAPOLIS, IND., Feb. 10—There have been important developments in the last week in the plans for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30. Charles P. Root has been named as official starter and assurance has been given of several additional immediate entries.

Root will succeed Fred Wagner, who has been official starter of the local speedway since it was established. Wagner is more or less in disfavor with the speedway officials at the present time. Root had warm support from Chicago and Detroit friends for the appointment.

A cablegram has been received from Albert Guyot, a prominent French driver, that an entry for an English Sunbeam racing car has been forwarded by mail. The car will be driven by Guyot. He won the light car class in the French Grand Prix of 1908 and finished fourth in the three liter race at Boulogne in 1909. The Sunbeam is a six-cylinder car with 3.5-inch bore and 6.3-inch stroke.

The Ideal Motor Car Company has entered its third Stutz car in the event, nominating Don Herr as driver. It is reported that the company is negotiating with Joe Dawson, who won last year's 500-mile race, to drive in the coming event.

European Cars for Indianapolis

PARIS, Feb. 1—(*Special Cable*)—Indianapolis will obtain the finest racing cars Europe can provide for the 500-mile race to be run on the speedway on Decoration day. In addition to the six-cylinder Sunbeam now being fitted out in England for the French driver Albert Guyot, the Peugeot Company, has decided to send two of its 1912 racing cars across the Atlantic in charge of Jules Goux and L. Zuccarelli. One of the cars is the big racer which was driven into first place at Dieppe with Georges Boillot at the wheel; the other is an identical car with which Goux secured first place in the fall race at Le Mans. These cars are looked upon as the fastest road racers ever built. Boillot's Peugeot showed an average speed of 68.5 miles an hour over a distance of 956 miles in the two-day Dieppe race last year; the same car clipped nearly one second off the Mont Ventoux hill climb record which had been held for 4 years by a big Brasier; at the Boulogne meeting it secured all the prizes, covering 7 kilometers flying start over give and take roads at 101.5 miles an hour; the flying kilometer at 77.6 miles an hour and the 3-kilometers standing at 86.9 miles an hour.

The motors at present have a bore and stroke of 4.3 by 7.8 inches, which gives a cylinder area of slightly more than the 450 cubic inches allowed under the Indianapolis rules. Arrangements have already been made, however, to fit a new set of cylinders with a slightly smaller bore so as to bring the cars within the limits. All other features, comprising the special type of direct operating camshaft will be retained. During the past season no attempt was made to gain speed by decreasing head resistance, even the short distance races being run without wind cutters. With wind cutting bodies and a few detail improvements it is possible to make the cars 2 or 3 miles an hour faster than at present.

The Peugeot drivers, Goux and Zuccarelli have never driven in America. Jules Goux has had his entire racing experience with

the Peugeot Company. After riding motorcycles he handled the firm's long-stroke single-cylinder racers, then their light cars, and finally the 175 horsepower racer built last year. At Dieppe he had to retire, like the late David Bruce Brown, for taking gasoline away from the official station. At Le Mans he got his chance and brought his big Peugeot in first.

Eight Entries for Chicago Non-Stop

CHICAGO, Feb. 10—Eight entries for the Chicago Automobile Club's day-and-night non-motor stop reliability to Boston were secured at the show last week—something remarkable when it is considered that the contest will not take place until the latter part of June. The first was a Packard six nominated by E. C. Patterson, a private owner, while the others are two Abbott-Detroits, two Stavers and three Imperials. In addition several other good prospects were discovered and it is thought that entries will be forthcoming from the Edwards-Knight, Speedwell, Lozier, Chevrolet, Case, Alco, De Dion, Cutting, Haynes, Mercer, KlineKar, Moline, Studebaker and Havers.

The sanction of the American Automobile Association has been secured by the club, following which the entry blanks were issued. Supplementary rules approved by the A. A. A. contest board are somewhat radical in that the contest is made a free-for-all without price classification; that no time will be added for tire trouble and that the affair will run continuously day and night.

Endurance Run for Sicily

PARIS, Feb. 1—Announcement is made by Chevalier Florio, the organizer and donator of the Targa Florio race that this event will take the form of an endurance contest round the Island of Sicily on May 11 and 12. Last year this was a non-stop run, the cars traveling day and night. Owing to the danger of sending high speed cars over the mountain roads at night time, it has been decided to make the race a 2-day event, the first day's run being from Palermo to Girgenti, and the second day's event the continuation of the run from Girgenti to Palermo. The race will be run under the rules of the Automobile Club of Italy. Last year the Targa Florio was won by an Englishman, Cecil Snipe, driving a Scat car.

Joscelyn Proposes Increased Garage Rates

Louis J. Joscelyn, the proprietor of the New York garage bearing his name and president of the New York Garage Owners' Association, has suggested in a letter to the garage trade that the storage rates on all automobiles be raised \$5 per month. He maintains that at the present storage rate it is well nigh impossible to profit on the garage business proper, so that the owners are forced to make a relatively high profit on the gasoline sold by the garages. The proposed remedy, according to Captain Joscelyn, would enable the garage owners to make a sufficient profit on the cars storage and would work out to the advantage of owner and garage man alike in the long run.

A. C. A. Keeps Laboratory

At a meeting of the board of governors held last Thursday it was decided that in view of the fact that one of the objects of the club is to encourage research work, the laboratory of the Automobile Club of America will be continued. The laboratory will be run on a more economical scale. A large deficit caused by the laboratory being idle for a part of the time will be avoided in future and more effort will be put into commercial work. It had practically been decided that the laboratory was to be abandoned and turned over to the S. A. E. or some other institution—perhaps a university.

Chicago Show Half Over —Increase in Attendance

N. A. A. M. Decides Upon Holding 1914 Exhibition in That City

Also Discussed Merger with the Automobile Board of Trade, But No Action Was Taken

CHICAGO, Feb. 10—The first half of the Chicago Show, that devoted to the pleasure cars, came to a close Saturday night and it now is stated that the attendance showed an increase of something like 10 per cent. over the same week last year. The first two nights of the show brought out a smaller attendance than usual, just as it did at New York, but every night after that showed an increase over last year. The attendance of dealers was the remarkable part of it all, there being 3,800 agents registered, 800 more than last night, of these, fifteen or twenty came from as far away as New Zealand, Vancouver and Berlin.

The Chicago show will be held in 1914, although some makers have been against it. That has been officially decided upon by the executive committee of the national association of automobile manufacturers, which held a meeting last Wednesday and formally listed next year's event. This action was not precipitated by the letter sent out by Colonel Pope to the motor industry and that letter did not come before the meeting in a formal manner, although it was informally discussed. Colonel Popes' epistle was devoted to arguing against showing as being too expensive, the claim being made that shows in this country have outlived their usefulness.

The N. A. A. M. also discussed the merger with the automobile board of trade but no action was taken.

It looks as if the deal would go through and the Automobile Chamber of Commerce be the result. At the present time signatures of members are being secured. More than 70 out of 103 have been landed. The association appointed W. L. Day, of the General Motors, on the Commercial Vehicle Committee, and also made him its vice-chairman.

Edwards Gets Findlay Plant

FINDLAY, O., Feb. 8—Because J. G. Cleary, of Milwaukee, Wis., who bid in the plant at receiver's sale at \$50,000, could not furnish the court's stipulations, the Findlay Motor Company plant has been transferred to W. W. Edwards, of Leipsic.

Rubber Market Continues Quiet

There was an absence of new developments of importance in the crude rubber situation yesterday either at home or abroad. The markets on both sides of the water were quiet. On the eve of the fortnightly auction of plantation rubber which opens in London February 12, consumers were generally holding aloof from the markets, while there was apparently little trading of a speculative character in progress. In London prices moved in a narrow groove. The ruling tone was fairly steady, the lack of any demand of importance being offset by an absence of pressure to sell. In New York City, the market was quiet, with the dealings apparently confined to a few small parcels. Fine upriver Para sold at \$.99 1-2 a pound, and coarse at \$.76.

New Car for Canada

ST. JOHN, N. B., Feb. 10—The Maritime Six has made its appearance. It has been specially designed to negotiate road conditions in Canada. The Maritime Motor Car Company, Ltd., plans on turning out between 200 and 300 of these cars this year.

At first their factory will only be used to assemble and put together the parts of the car, which will be manufactured elsewhere, but it is intended as business develops to arrange for the manufacture of different parts until the whole car represents the product of the factory. The company's factory, covering 2 acres of ground, is the largest in Canada, and in its arrangements is one of the most up-to-date on the continent. It has a capacity of 1,000 cars per year. The management expects to have 100 men employed in the factory this year.

Twenty-Seven Makes at Madison

MADISON, WIS.—Twenty-seven different makes of cars will be on display at the third annual Madison motor show, which will be given by the Madison Automobile Dealers' Association in the New City Market building on February 18 and 19. This is the largest number of exhibits ever made here. Madison dealers are searching for a larger exhibition hall, but at present there is none in sight.

Denver Show Committee Busy

DENVER, COL., Feb. 10—Preparations for the twelfth annual Denver Automobile Show, which is scheduled for March 3-8, in the Municipal Auditorium, have reached a point where the success of the exhibition, both artistically and financially, is practically assured. Already the representatives of more than half of the cars handled in the Denver territory have signed for space on the main floor.

Manager N. H. Van Sicklen, Jr., who is now in Chicago attending the National Automobile Show, wires that several of the pleasure car exhibits now on display there will be transferred entire to Denver for the week of the show.

Automobile Securities Quotations

Among the principal developments of the week was the new advance of Miller Rubber, which rose 40 points. Consolidated preferred gained 28, closing at 106, while its common stock, like Firestone common rose 2 points. Swinehart fell off likewise, and the same applies to the price asked for U. S. Motor common and second preferred while the first preferred rose 30 points with no bid.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com.....	..	..	165	185
Ajax-Grieb Rubber Co., pfd.....	..	..	95	100
Aluminum Castings Co., pfd.....	..	..	98	100
American Locomotive Co., com.....	33	33 1/2	39	40
American Locomotive Co., pfd.....	104	104 1/2	104 1/2	105
Chalmers Motor Company.....	..	..	135	145
Consolidated Rubber Tire Co., com.....	10	15	23	25
Consolidated Rubber Tire Co., pfd.....	20	30	106	108
Firestone Tire & Rubber Co., com.....	200	205	355	362
Firestone Tire & Rubber Co., pfd.....	108	110	106	108
Garford Company, preferred.....	..	..	105	107
General Motors Company, com.....	34	36	34	35
General Motors Company, pfd.....	74 1/2	76	78	79
B. F. Goodrich Company, com.....	..	..	55	56
B. F. Goodrich Company, Pfd.....	..	..	103	104 1/2
Goodyear Tire & Rubber Co., com.....	330	335	460	470
Goodyear Tire & Rubber Co., Pfd.....	104	106 1/2	104	105
Hayes Manufacturing Company.....	..	..	..	90
International Motor Co., com.....	..	..	5	15
International Motor Co., pfd.....	..	..	25	40
Lozier Motor Company.....	..	..	..	32
Miller Rubber Company.....	..	..	195	200
Packard Motor Company, pfd.....	104	107	103	105
Peerless Motor Company.....	..	..	120	125
Pope Manufacturing Co., com.....	38	40	29	32
Pope Manufacturing Co., pfd.....	68	70	75	78
Reo Motor Truck Company.....	8	10	11 1/2	12 1/2
Reo Motor Car Company.....	23	25	20 1/2	21 1/2
Studebaker Company, common.....	..	..	34	35
Studebaker Company, preferred.....	..	..	92	93
Swinehart Tire Company.....	..	..	104	105 1/2
Rubber Goods Mfg. Co., pfd.....	100	105	105	108
U. S. Motor Company, com.....	..	..	..	8 1/2
U. S. Motor Company, 1st pfd.....	..	..	..	65
U. S. Motor Company, 2nd pfd.....	..	..	..	35
White Company, preferred.....	..	..	105	108
Willys-Overland Company, com.....	..	..	70	71
Willys-Overland Company, pfd.....	..	..	98 1/2	99 1/2
U. S. Rubber Co., com.....	..	..	67	67 1/2
U. S. Rubber Co., 1st pfd.....	..	..	107	107 1/2

Show Doings at Various Cities Throughout States

Many of the Smaller Shows Have Announced Their Opening Dates

Committee Decides Chicago 1914 Show Dates Will Be About Same As This Year

HARTFORD, CONN., Feb. 9—The sixth annual car show of the Hartford Automobile Dealers' Association, conducted under the auspices of the First Infantry, C. N. G., was officially opened at the State armory, Saturday evening by Mayor Cheney. Present indications are that the show will be larger and better than previously. There is more of a business aspect about this year's show than formerly. Thirty-five makes of gasoline pleasure cars are shown, nine of which are new comers, six different makes of pleasure electrics are displayed, three of these are new arrivals. Thirteen different makes of gasoline commercial cars are shown, several of these were never before shown in this city. The showing of electric trucks covering two different makes is most complete and one make of industrial electric truck is displayed.

Brooklyn Show to Be Splendid

The Brooklyn, N. Y., show, under the management of the Brooklyn Motor Vehicle Dealers' Association, will surpass in

magnitude and splendor all previous exhibitions held in that city, unless indications cannot be trusted. The show will open on the evening of Washington's Birthday at the Twenty-third Regiment Armory, and so far seventy companies have leased spaces on which they will show a total of about 250 cars. The remaining spaces will probably be filled by the opening day, and it is expected that more cars will be seen than were at the Manhattan shows.

A unique decorative scheme will be used, the interior of the Armory being decorated as a Californian landscape, sunset effect, the entire building to be illuminated by concealed lights. The lobby will be lighted by tungsten lamps contained in transparent columns.

Ready for Richmond Show

RICHMOND, VA., Feb. 9—On Monday, February 17, the first annual automobile show in Richmond will be held in the Horse-show building and will continue for the entire week. The show will be given under the auspices of the Richmond Automobile Dealers' Show Association and more than 100 cars of all kinds and sizes will be on exhibition.

Spaces Alloted for Syracuse Show

SYRACUSE, N. Y., Feb. 8—The Syracuse Automobile Dealers' Association held a meeting Monday night to decide space allotments for the annual motor car show at the Armory late in the present month. There were 100 spaces to be sold, 75 per cent. of which had been applied for by exhibitors in this city and other parts of the state. However, manufacturers throughout the country will be represented in the exhibits. It has been decided to require all exhibitors desiring guest tickets to pay for them in advance and the money for all those not used will be refunded after the show.

Same Dates for 1914 Shows

CHICAGO, Feb. 7—At the regular monthly meeting of the executive committee of the National Association of Automobile Manufacturers, Inc., held at the First Regiment Armory, the members voted unanimously to hold the 1914 show on dates corresponding with those of the present season. The drawing takes place early in October.

The members of the committee present were:

Wm. E. Metzger, Metzger Motor Car Co.
S. T. Davis, Jr., Locomobile Co. of America.
H. H. Rice, Waverly Co.
H. O. Smith, Premier Motor Mfg. Co.
Charles Clifton, Pierce-Arrow Motor Car Co.
Hugh Chalmers, Chalmers Motor Co.
L. H. Kittredge, Peerless Motor Car Co.
W. C. Leland, Cadillac Motor Car Co.
S. A. Miles, General Manager, N. A. A. M.
J. S. Marvin, General Traffic Mgr., N. A. A. M.

W. L. Day, General Motors Company, was appointed a member of the commercial vehicle committee, and made its vice-chairman.

The association has undertaken to ascertain what manufacturers intend to exhibit at the Panama-Pacific Exposition in a separate building to be known as the Automobile Palace. It was reported at the meeting that a large number of members had already made favorable responses.

Harrisburg Show in March

HARRISBURG, PA., Feb. 8—Plans are in progress for the annual automobile show of the Harrisburg Dealers' Association, Harrisburg, to be held in the Rex garage and Arena theater, Third and Delaware streets, March 15 to 22. Prospects look bright for a good show and space has already been signed for nine different makes of car. The two spacious halls will provide 17,000 square feet of floor space for the various automobile and accessory exhibits. A feature of the show will be a truck exhibit, which will be held in the Rex garage building.

Market Changes for the Week

Tin was stronger in tone and again higher at London and sympathetically stronger in the local market. In the open market trading was light and spot tin was nominal at \$49.63, a gain of \$.93 for the week. Both coppers and cottonseed oil experienced changes, the former losses and the latter a gain. Lead remained quiet and easy, calling for \$4.30 per hundred pounds. While there was an undercurrent of steadiness on the cottonseed oil market yesterday, it could not be said that the price changes were especially significant, rising \$.01, closing at \$6.33 per barrel.

Domestic scrap rubber remains in a steady position. Reclaimers are absorbing moderate quantities and fair clearances are noted from the seaboard for various foreign countries. Automobile tire scrap remained constant throughout the week closing at \$.09 7-8. The market for refined petroleum continues strong, influenced by the recent advances in crude oil. The price of crude, Pennsylvania and Kansas wells, is \$2.50 and \$.88 resp.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Change
Antimony, per lb.	.08 1/4	.08 1/4	.08 1/4	.08 1/4	.08 1/4	.....
Beams & Channels, per 100 lbs.	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton.	28.50	28.50	28.50	28.50	28.50	.....
Copper Elec., lb.	.16	.15 3/4	.15 3/4	.15 3/4	.15 3/4	-.00 1/4
Copper, Lake, per lb.	.16	.15 3/4	.15 3/4	.15 3/4	.15 3/4	-.00 1/4
Cottonseed Oil, Feb., per bbl.	6.32	6.32	6.32	6.32	6.33	+.01
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden						
Brown	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 Gal.	.22 1/4	.22 1/4	.22 1/4	.22 1/4	.22 1/4	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.....
Lead, 100 lb.	4.30	4.30	4.30	4.30	4.30	.....
Linseed Oil	.50	.50	.50	.50	.50	.....
Open-Hearth Steel, ton.	29.00	29.00	29.00	29.00	29.00	.....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa. crude	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.....
Silk, Raw Italy	4.30	.....	.....	.....	4.30	.....
Silk, Raw Japan	3.75	.....	.....	.....	3.75	.....
Sulphuric Acid, 60 Beaumé	.90	.90	.90	.90	.90	.....
Tin, 100 lbs.	48.70	49.25	49.50	49.50	49.63	+.93
Tire Scrap	.09 3/4	.09 3/4	.09 3/4	.09 3/4	.09 3/4	.....

Digest of the Leading Foreign Journals

Threefold Advantages in Sight by Finishing Motor Vehicle Bodies by Schoop Method Rather Than with Paint and Varnish—New Charging Valve in Two-Cycle Motor—Another Convert to Mixing of Air and Fuel in the Jet—Wheels

SCHOOP'S Metallizing Method For Motor Vehicle Bodies—As automobiles travel farther and faster than ordinary carriages and are bespattered with mud and begrimed with dust in much higher degree, the problem of keeping them looking new and neat is one which presents grave difficulties so long as ordinary coach varnish, or any similar unmechanical substance which is soft and sensitive and can be renewed only in its entirety and by a costly and time-consuming process, is employed for the exterior coating of the vehicle body. In the case of motor trucks and delivery wagons, even ordinary paint is found unsuitable for the purpose, as it becomes shabby very quickly and a good fresh coat of paint cannot be put on over night, nor in patches, and it is expensive and inconvenient to take the vehicle out of commission—so much more expensive, as compared with former conditions, as each motor vehicle takes the place of two, three or four of the vehicles formerly used and also requires repainting three, four or five times as frequently in order to present a similar degree of neatness in appearance.

With these things in view, any new method for finishing the bodies of automobiles and commercial motor vehicles with a smooth and slightly substance, less sensitive to dirt and dust than paint and varnish, seems to command careful investigation of its possibilities, and the Schoop method for metallizing almost any surface by means of a hot metallic blast is prominent in this respect, partly because it has already attracted the widest attention in technical, industrial and financial circles and partly because its further development seems to hold out a promise that it will soon become possible by means of it not only to cover a wooden or metallic surface with a hard, smooth and non-rusting metallic coating, as now can be done with great rapidity, but also to mix coloring matter into such a coating and to obtain any desired color effect without additional labor or skill. Other applications of the method to finishing work and other purposes of interest in the automobile industry will be apparent from the following notes on the subject by Engineer Steinacker in *Elektrochemische Zeitschrift*. He writes in substance:

The idea of producing coatings by a spraying method is not altogether new. Coloring matter and mortar, for plastering, have been sprayed onto a surface by means of suitable apparatus and compressed air for some time past. The air brush device is in this class. The desire to do the same with metals was natural, but its realization met with practical difficulties, and the industrial world had to fall back upon electroplating for this class of work until U. M. Schoop, a well-known electrochemist of Zürich, Switzerland, devised a method which in the main consists in hurling finely comminuted metal against the object to be coated with great force and by means of gases or vapors which are either inert or at least not highly oxidizing. The manner in which the spray of metal is produced is not of importance, so long as it is fine enough and is thrown out with sufficient force. The speed with which the spray leaves the nozzle of his apparatus rises, with a working pressure of 20 atmospheres, to

1,500 meters per second and, as the particles of metal, when they strike the surface to be coated, are not yet fully solidified but remain plastic for a few moments, they are welded into a perfectly homogeneous and adhering film under the high pressure of the stream. It was the casual observation of the fact that a lead bullet when shot against a hard, smooth wall, forms a smooth and adhering film which led Schoop to the working principle of his invention.

Naturally, the easily fusible metals are most readily used with this process, if only because a moderate gas pressure is sufficient in handling them. But the chemical and physical properties of each metal are also to be considered, as well as the thickness of the intended coating and the nature of the surface to be coated. And therefore experiments extending over several years were necessary before the method could be declared industrially ripe.

Many interesting facts were ascertained during these experiments. It was shown that fused metal is cooled to 60 deg. C. or lower when atomized by certain highly compressed gases, and to this fact it is due that even substances which are readily ignitable, such as paper, wood, textiles, celluloid and dynamite can be so metallized. It was also found that the films have the same density as the normal metal and that tin, for example, when sprayed on in this manner, has a hardness of 14.2, by Brinell test, while cast tin has only 9.5. Furthermore, if the surface to be coated is properly prepared, the film adheres so closely that it can be worked as part and parcel of the substance itself.

It follows from these properties that the process is of interest to nearly all branches of industry, affording the means for protecting any finished article against rust, moisture and similar influences or giving it an ornamental coating in one of the art metals and also being particularly adapted for taking impressions for use in the making of matrices and dies. In the electroplating industry it renders it possible to do in a few minutes what has so far taken days.

As it has also recently become possible to produce convenient, simple and portable Schoop apparatus (see *THE AUTOMOBILE* of Jan. 9, page 163), any industry and any factory is enabled to take up the process.

It is one of its advantages that it renders it possible to apply coatings of aluminum, a metal which so far could not be used in this manner, and it can be used for purposes of soldering or welding, taking the place of autogenous welding in some instances, as in the production of seamless tubing from sheet metal.

The wide scope of the process has been recognized all over the world. The possibility of protecting wood which is to be exposed to the weather or moisture by a single treatment lasting for all time and of saving the paint in the case of bridges and ships has proved very attractive commercially, and large syndicates have been formed, first in France, then in Belgium and very recently in Mexico, which have acquired the inventor's patents for the respective countries and in turn dispose of apparatuses and license to use them within their territories. The

license fee is scaled according to the number of apparatuses and their capacity in each instance, so that even concerns which are not vitally interested can make use of the method. Negotiations are already under way in all industrial countries looking to the exploitation of the method on a large scale, and it can therefore not be considered too early for any industry in which the process is needed, or in which it may be applicable in a modified form coming within its possibilities, to investigate these possibilities now.—From *Elektrochemische Zeitschrift*, January.

Elegance of Lines—Even some of our greatest firms might derive some inspiration from studying the graceful lines which characterize the design of mechanical parts in all Italian cars.—From *Omnia*, (Paris).

TWO-CYCLE Motors—No design of two-cycle motors has yet been accepted as standard by the industry or by the public, but the mere fact that they belong among valveless motors, in so far as no poppet valves are used in them, has pushed them into the technical limelight in Europe and has drawn attention to the performances in long-distance racing which stand to the credit of two two-cycle motor cars, the Koechlin and the Côte. Their reliability, under racing conditions at least, has been demonstrated, and those who promote sleeve-valve and rotary valve motors point to this among other developments in support of the contention that poppet valves can be dispensed with and that the mechanical resources for simplifying automobile motors have not by any means been exhausted. The great development which has taken place in two-cycle Diesel motors for stationary as well as for marine work has also tended in the same direction. On the other hand, the question of combining the rotary valve or the sleeve valve with the two-cycle mode of operation has come up for consideration and attempts have been made—one of them reported as successful—at applying the two-cycle principle in aviation motors with rotating cylinders. Under these circumstances an improvement recently introduced in the Côte motor and which relates directly to the distribution of the gases and the avoidance of fuel waste, gains timely interest. As drawings showing it incorporated in the motor are not available, this new device is shown separately in Fig. 2, while Fig. 1 shows two sectional views of the Côte motor to which it has now been applied. The operation of the Côte motor is described substantially as follows:

The pistons in this motor are of the two-story variety which has been generally adopted since the practice of first drawing the explosive charge into the crankchamber was abandoned (mainly to avoid leakage at the end-bearings of the shaft and exudation of lubricating oil at the same place), and an annular space between the lower portion of the piston and the wall of the enlarged cylinder serves for storing the gas charge until

it can be transferred to the combustion chamber. When the piston descends, it causes a suction from this annular chamber which draws the gas mixture from the carbureter by way of the channel J and through the check valve K and pipe T. At the same time the upper portion of the piston has uncovered the exhaust port O, allowing the burnt gases to escape through pipe Q, and almost at the same moment it has also uncovered the port N which communicates with the reservoir M and the combustion chamber receives from it, while still exhausting through port O, a fresh charge of gas coming from the annular chamber of the other cylinder, in which the piston is just completing its upstroke, so as to drive the contents out of said annular chamber and into said reservoir M. The new charge in the first cylinder is guided toward the top of the combustion chamber by the deflector plate H on top of the piston, and the experience gained in the matter of shaping and dimensioning the deflector and the ports has advanced to such a point that the incoming charge assists in driving the burnt gas out without becoming mixed with it to any great extent at the normal or higher motor speeds. But at much reduced speeds it has never yet been found possible to avoid a loss in efficiency from this cause and a resulting smaller flexibility of the motor under the throttle, as compared with four-cycle motors. In the illustration B is lower portion of the piston surrounded by the annular suction and charging chamber, L and M concentric reservoirs connecting the two co-acting cylinders, R the port of entry for the cooling water, S a breather, ef helical gears controlling the magneto F, d the spark plug, h the return conduit for used lubricating oil.

The improvement by which the economy and flexibility of this motor are to be secured under all conditions of operation takes the form of a shuttle N, Fig. 2, comprising two steel plates p and p' connected by a rigid tubular bar and adapted to be moved to and fro in the cast cylinder F. This cylinder is closed at its two ends B and B' and is broken by three rows of circular openings O, O' and O'', so spaced apart that only two of them can be between the end-plates of the shuttle at the same time. The diameter of the openings equals the thickness of the plates. The middle row is connected with the carbureter by a circular conduit, while the two others are connected in the same manner with each of the motor pumps (the annular chambers in Fig. 1).

The operation is as follows: Suppose the motor starts from the position shown in Fig. 1, with the shuttle in its middle position and the pump to the right beginning to compress its charge. The shuttle is at once pushed to the left under the pressure of the gas and opens at the same time the channels O and O' so as to connect the pump in the other cylinder, which at that moment works at suction, with the carbureter. It also compresses the gas at M between its front plate and the bottom B of the distributor cylinder, and its motion continues until this compression equals that which drives the shuttle. Now, as soon as the motor piston uncovers the ports in the cylinder walls, the pressure in the corresponding pump falls at once and the air cushion at M expands and drives the shuttle back to its middle position. The work of the pumps is then reversed and the shuttle travels in the opposite direction under the pressure from the pump of the left cylinder.

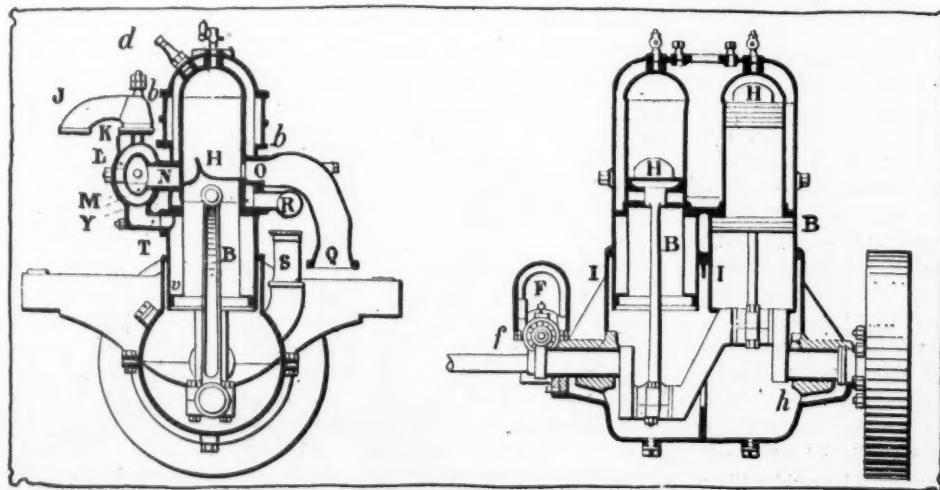


Fig. 1—Transverse and longitudinal sections of Côte two-cycle motor

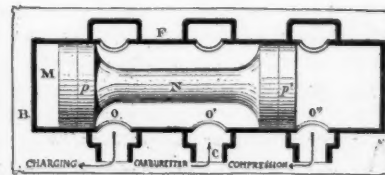


Fig. 2—Shuttle for Côte motor

As the shuttle is always held between two gas cushions there are no shocks or noise. [It is not stated, however, what means are employed for making sure of finding the shuttle in the right position when the motor is to be started.—Ed.]—From *La Vie Automobile*, January 2.

REPRESENTATIVE Carbureters—In a brief review of the progress recorded for the past year in the different construction features of automobiles, there are mentioned several carbureters as exemplifying the trend of progress. Among these the "Jarnac" and the Brewer have been recently described in the columns of *THE AUTOMOBILE*. One of the Longuemare models and the Langeron are also among them and are illustrated in Figs. 3 and 4. The features of the Longuemare are briefly as follows: The jet is a double concentric one, the outer annular channel G serving for normal motor speeds and

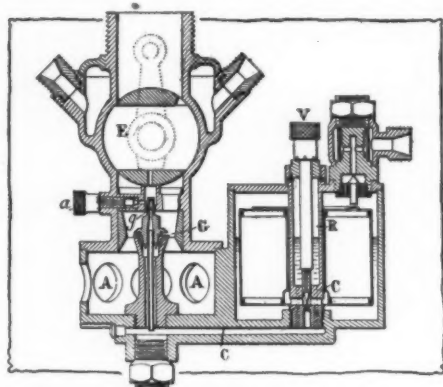


Fig. 3—Longuemare Carbureter

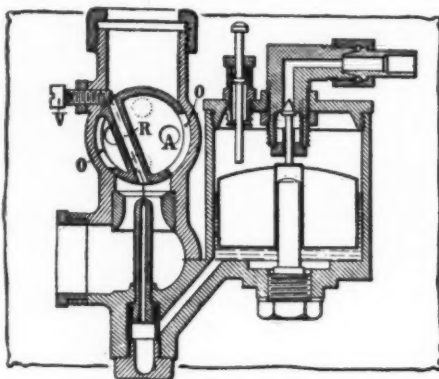


Fig. 4—Langeron Carbureter

the central channel g for keeping the motor running idle at minimum speed when the car is at a standstill. The air feed for the latter is subject to adjustment by the screw a. As shown in Fig. 3, it remains in action when the throttle is completely closed. The normal air intakes AA are not varied, but the gasoline feed can be regulated to suit the motor by the screw V. The fuel conduit C is in communication by special small perforations, shown in dotted lines, with a cavity R which is independent of direct regulation by the float action and forms a fuel reserve useful for accelerations and starting. It also has another function. At high motor speeds it is drained by the strong suction without having a chance to fill up from below, and then air is sucked in through the perforations referred to and is mingled with the fuel in the jet G, so as to assist in atomizing it and also holding its proportion to the air down to what it should be. The new Longuemare represents thus another conversion among the old-time makers to the new principle of mixing air with the fuel in the jet. An arrangement for heating the induction pipe from the cooling water or the exhaust gas is noticed above the throttle in the illustration.

The Langeron carbureter, Fig. 4, seems to represent simplicity and economy in design. It has only a single jet, but the throttle drum has a cross-channel R, whose section may be regulated by screw V, and the suction from the cylinders acts through this channel alone when the motor is completely throttled down, the illustration showing the carbureter at this adjustment. When the throttle is opened up and the suction takes effect through openings OO, the apertures AA in the flat side walls of the throttle drum register more and more completely with similar apertures in the carbureter wall.

In the Brewer carbureter, as in the new model Longuemare, the air and gas passages are of constant section and the automatic regulation takes effect on the liquid fuel only.—From *Le Génie Civil*, January 11.

ABOUT Wheels at the Shows.—The metallic wheel dominates but the wood wheel defends itself. The public likes the strength of the former and the form of the latter. This ex-

plains the success of the Sankey wheel which combines both features and is seen almost everywhere. The demountable wheels are becoming numerous and are getting better every day. The great specialists in this line, Rudge-Whitworth, Hall, Dunlop, RAF and Riley have accomplished marvels in mechanical construction and their means for locking the wheels in place vie with each other in shrewdness and subtlety. On the other hand, certain car builders have equipped their chassis with demountable wheels of their own devising and of enchanting simplicity. In the *Zèbre* car, for example, the wheel is locked simply by means of the hub cap which is screwed upon the end of the axle. To prevent the cap from budging, it is provided with a number of cogs, and the hub is provided with similar cogs but one more of them. If there are five cogs on the cap and six on the hub, for example, a one-thirtieth part of a turn will bring two cogs in line, and the hub carries an elastic split-collar with a pin, and when two cogs are in line this pin is passed through them. It is held by the elasticity of the collar.

The demountable rim battles constantly against the demountable wheel, having in its favor lightness and cheapness. But it is sometimes difficult to operate.

An interesting wheel is shown by Riley, in which wire spokes are inclosed in rigid tubular steel spokes, as shown to the left in Fig. 5. The wires work under tension and the tubes under compression. The rigidity of the wheel as a whole is absolute and its lightness is remarkable. Perhaps it is the wheel of the future. In another Riley wheel a wire spoke is passed through a central bore in each wood spoke,

as shown to the right in Fig. 5 and the appearance is that of an ordinary artillery wheel, excepting that the rim is metallic and light.—From *Omnia*, January 4.

Traps in Steel Testing—Careful experiments have shown that the customary tensile tests of steel specimens in themselves affect the steel which is being tested and that the Brinell test does the same. Even tests by scleroscope cannot properly be repeated in the same spot without showing a greater hardness than the untested steel possesses. The error seems to average larger for the elastic limit than for the ultimate strength.

Austria has now imitated Germany in imposing a tax on motor tourists. For an automobile or a motorcycle the owner is to pay 40 cents per day. The automobile can stay for three months before it becomes subject to the ordinary annual taxation but the motorcycle only one month.

Motor Hearses Now Silent—Success in the mechanical campaign for silent automobiles has resulted, among other things, in a boom for the motor hearse in European countries.

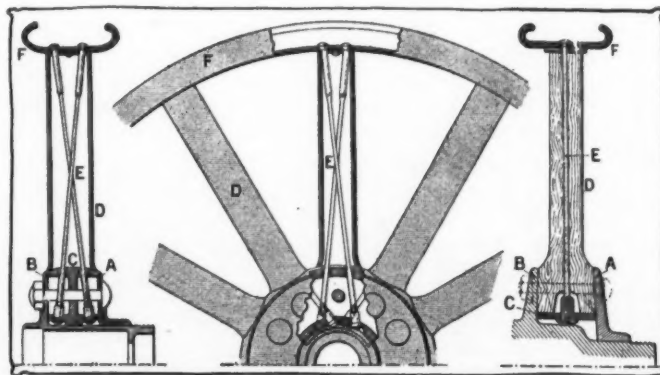


Fig. 5—Riley combined wire and tubular or wood wheel

Communications from The Manufacturer

Metallurgy of Shafts and Rods and Comparative Analyses— Cost of Running an Electric

SPRINGFIELD, O.—Service tests of chrome-vanadium and nickel steel shafts of identical design, and on the same car, conducted by the Kelly-Springfield Motor Truck Company, demonstrated conclusively the greater strength of the chrome-vanadium steel.

As a result of the tests, chrome-vanadium steel was adopted for jackshafts for their different truck chassis, from their 1-ton truck up to the heaviest model.

In making these tests, they equipped a 1-ton truck with a chrome-vanadium steel jackshaft on one side and a nickel steel jackshaft on the other.

The two shafts were identical in design. They were 1.37 inches in diameter and 24, 25, 32 inches long. The chrome-vanadium shaft was manufactured by the Carnegie Steel Company, and was of the steel company's "A Regular" type and heat-treated in accordance with their standard practice.

The method of conducting the tests for the details and results of which we are indebted to the Kelly-Springfield Motor Truck Company was as follows:

A 1-ton truck was rigged up with a 2-ton load, as shown in the accompanying photograph. It was then run continuously night and day for a period of three weeks, during which it was subjected to all possible strains. From the illustration which shows the truck after the completion of the test, it is evident that some "hard going" was experienced.

At the end of the three weeks constant driving, the nickel steel shaft showed a very perceptible twist, while the chrome-vanadium shaft showed no effect whatever from the strains.

All conditions being absolutely identical, the results were directly comparable and furnish indisputable proof of the greater strength of the chrome-vanadium steel.

This shaft was made to the following specifications for chemical composition and physical properties:

CHEMICAL ANALYSIS

Carbon.....	0.24 to 0.30 per cent.
Manganese.....	0.35 to 0.65 per cent.
Phosphorus.....	under 0.04 per cent.
Sulphur.....	under 0.04 per cent.
Silicon.....	under 0.20 per cent.
Chromium.....	0.75 to 1.25 per cent.
Vanadium.....	0.16 to 0.20 per cent.

PHYSICAL PROPERTIES

Elastic limit, lbs. per sq. in.....	120,000
Tensile strength, lbs. per sq. in.....	130,000
Elongation in 2 in., per cent.....	23.8
Reduction of area, per cent.....	49.4

Because of the superior merits of vanadium steel as shown by these tests, this type of alloy steel has been adopted for a number of the other parts of the truck, which are subjected to the greatest strains. Among these are the propeller shafts and the connecting rods.

In the latter case, vanadium steel was used in order to keep the weight of the reciprocating parts down to a minimum.

By the use of vanadium steel, a rod of lighter section is safely employed than would be deemed advisable if made of carbon steel.

For their 40-horsepower motors, a tapered channeled rod, 14 inches center to center is used. The flanges are .156 inches thick and the web .187 inches thick. At the crank pin end, the section is 1.625 inches deep with 1.125 inches width of flange. From this, it tapers to 1.125 inches depth and .875 inches width of flange at the other end.

In their 30-horsepower motors, the rod is similar in design, but of lighter section and 11 inches long. In this rod the flanges are .635 inch wide and .125 inch thick and the web .187 inch thick. At the crank pin end, the section is 1 13-32 inches deep, tapering to 1 1-32 inch at the opposite end.

The connecting rods are made to the following specifications for physical properties:

Elastic limit, pounds per square inch.....	100,000 to 110,000
Tensile strength, pounds per square inch.....	120,000 to 130,000
Elongation in 2 inches, per cent.....	20 to 22
Reduction of area, per cent.....	50 to 55

—KELLY-SPRINGFIELD MOTOR TRUCK COMPANY.

Running Expense of Electrics

The Woods Company have seldom published figures covering maintenance cost because none can be given which would be any criterion for the intending purchaser. Many people who use their electric machines a great deal find it costs them less than some of their friends who use their machines very much less. Some owners charge their batteries too often. By this I mean they put their cars on charge when there is sufficient current still in the batteries to give ample mileage for another day's use. This too frequent charging not only adds unnecessarily to the expense of operating, but also shortens the life of the battery needlessly. For these reasons the table of actual expenses which I am giving, while it is fairly typical, is not in any respect a standard upon which to base an estimate of probable cost in any other case. Some owners could show figures very much lower than these, while others, through lack of attention to the simple details of proper charging, etc., have made their expenses much higher than there is any need of.

The following statement sent in by Mr. More, of Sioux City, Iowa, represents the total expense for electric current during the past 2 years:

TWO YEARS' RUNNING EXPENSE

1911	1912
January	January
February	February
March	March
April	April
May	May
June	June
July	July
August	August
September	September
October	October
November	November
December.....	December.....
	Total for 2 years.....

In submitting this statement Mr. More states, in a letter dated December 3, 1912, that Mrs. More uses her Woods Electric on every possible occasion it seems to him, and says further that there was no other expenses for operating the car other than included in the above table.—LOUIS E. BURR, Woods Electric Company.

Care of Spark Plugs

NEW YORK CITY—The following hints and spark-plug don'ts are given to autoists:

Don't fail to wash the plugs with gasoline, using a stiff brush and scour the electrodes lightly with fine emery cloth.

Don't forget to remove all particles of emery before replacing plugs.

Don't forget to carry extra plugs and whenever one is used be sure and replace those used.

Don't throw your old plugs or your extra ones, in the tool box or locker with a lot of old junk, keep them in a wooden box first having greased the threads to prevent rust and then securely wrap each one in cloth. Porcelains are easily cracked and electrodes easily bent by rough handling.

Don't let a bunch of loose heavy wires drag and pull on your plugs, support them or encase in fiber tubing.

Don't treat them like a nut, treat them like a watch.

Don't fail to examine daily for dirt and breaks.

Don't forget to use kerosene on the threads if the plug sticks.

Don't buy cheap unreliable plugs.—EMIL GROSSMAN.



The Engineers' Forum

Exhaust Gas Analysis

Engineers Discuss Value of Analyzing Exhaust Gases To Determine Engine and Carburetor Efficiency

Opinions of Breitenbach, Marshall and Chase—All Experts in This Work

Part II

NOTE—These discussions by leading engineers are from stenographic notes taken during the recent session of the Society of Automobile Engineers in New York City, where this pertinent subject proved one of the most interesting of the meeting.

NEW YORK CITY—I agree with Mr. Hewitt that power loss is due to the globules forming and due to condensation in the manifold. Another reason for power loss is the explosion chambers of our engines are too large. In order to get a proper explosion heat it has to be highly compressed. Now to compress it it requires a smaller chamber. I am sure if you would try the smaller chambers you would see you would have a better gas.

Another cause for poor combustion is due to the valves. Often a valve will not close early enough; and supposing the gas has just exploded in cylinder No. 1, this exploded gas comes out through an inlet manifold and mixes with the gas which is to explode in cylinder No. 3. Now cylinder No. 3 is not getting the same explosive medium as cylinder No. 1, due to having this partly exploded gas mixed in with the unexploded gas. I think that better results could be gotten if the explosive chambers were smaller and we have large exhaust valves.—J. M. Breitenbach.

Best Results Contained No Oxygen

New Haven, Conn.—I have made a good many tests on the exhaust gas analysis, and on different motors of different kinds, running under different road conditions and at different speeds and different speeds of transmission and different speeds on the road, running at different times, and my analyses have followed very closely those of Mr. Hewitt. The best results I got from any car were about 13½ per cent. of CO₂, and practically no oxygen and no CO.

In connection with my experiments I measured the gasoline at the same time to see whether this car was using gasoline in proportion to the amount of CO that appeared in the

exhaust. And the worst offender in this case backed up my conclusion that you can make an exhaust gas analysis and find that you have got about 5 or 6 per cent. of exhaust, and you have got a car that is running about 4 or 5 miles to the gallon. If you get an exhaust gas analysis that is in the neighborhood of 12 to 13 per cent. CO₂ and varying amounts of CO, O, that is, all small, and little free oxygen, you have got a car that is running 3 or 4 times as much. That is, the distance it will cover per gallon. I won't say it is in direct proportion, because that is not so, but it bears a close relation to the amount of CO in the exhaust.

The method of making exhaust gas analyses is not so complicated that any one need feel any apprehension about undertaking a gas exhaust analysis. He has got to be able to read the Dorsat and he has got to be able to get his gas into his apparatus without getting any air mixed with it, as I have found that out to my sorrow in one or two cases; and he has got to be sure that his apparatus is in good condition and his cylinders are in good condition.

The method of making exhaust analysis for the purpose of determining whether your mixture is right or not seems to me to be the only way of finding out whether you have a carburetor which gives you good mixture or not. The car that used the most gasoline had the worst percentage of CO, and a very large percentage.

Another point is to take an exhaust gas analysis when the car is standing idle. You will find cars running at garages and chauffeurs will tell you that it does not use any gasoline. You take an analysis of that exhaust and you will find anywhere from 5 to 6 or 7 per cent. of CO. If that is the case that car is probably using just as much gasoline when it is running idle as it would use in the same length of time when it is running on the road. If that is the case the gasoline consumption of that car when it is standing idle will be very much, and due to the fact that it is running without any load on the motor.—Prof. W. C. Marshall, Yale University.

Many Samples Improperly Taken

New York City—I think a great many of the difficulties which have arisen by people using the gas analysis to determine the efficiency of the motor was that the sample was improperly collected. I made a good many mistakes myself that way when I started, and I have been able to overcome that largely by properly collecting the sample. If, as I say, you collect the sample by simply allowing the gas to blow through it you are not at all sure of getting a fair average sample. Dr. Lloyd told me in a talk the other day that he had similar experiences himself when he started to take samples of exhaust gas from the motor. This is very important that you collect the samples properly, in such manner as not to get oxygen from the outside and also so as to get a good, fair average sample. Your results will surely be very confusing if you do not attend to that point.

Another difficulty is that if you attempt to take a sample by letting it flow quickly through the collection tube you are likely to get a sample which is not a regular sample of the whole run. There may be an instance in which the combustion in one cylinder has not been complete, does not show up by missing; there is no evidence of it, and yet probably there has been a little different combustion than you get as a rule with four, and hence as a result you might get less gas in that cylinder here and get a sample which would not be true for a sample. I have adopted the practice of displacing this water in this collection tube, taking

enough time to be sure to get an average sample. Of course you can do that as slowly or as rapidly as you wish, according to the length of run.

I make it the practice to take the sample at the top of the exhaust pipe, as close to the motor as possible, in order that there may not be any after-burning in the exhaust pipe. Of course the only effect of combustion is what takes place in the cylinder, and that is what we want to learn something about. I use a waterjacket around this pipe simply for convenience, to keep those connections from getting so hot that it would burn the ordinary rubber hose connection here:

I found very little, practically no hydrogen in any of the samples which I have analyzed from four-cycle motors. In two-cycle motors, where part of the charge flows by without ever being ignited, you of course will get hydrogen, and in that case you should make a test for hydrogen. I have used both Dr. Elliott's apparatus, which is very good, and the Orsat apparatus, which is not so accurate, but which is rather faster to use, and for that reason it serves my purpose better when I am not looking for accuracy greater than 0.1 per cent.

I have found this method of procedure, that is, measuring the air and the gasoline, and then taking the samples of the exhaust gases, a good way of comparing mixing devices, of which there are a good many on the market. If, as is claimed, you really get more power with one of those mixing devices, it should show up in giving you more complete combustion. It is therefore of considerable use in that connection.—Herbert Chase, A. C. A. Laboratory.

New French Power Rating

NEW YORK CITY—Editor THE AUTOMOBILE:—I notice that the horsepower formula which it is proposed to adopt in France for taxation purposes rates a four-cylinder motor 25 per cent. lower than a single-cylinder motor; that is, when the bore, stroke and most efficient motor speed should give the same power for the four-cylinder as for the single-cylinder motor, the rating is changed by varying a numerical coefficient 25 per cent.

In a six-cylinder motor the deduction would on the same principle be about 33 per cent.

I believe this manner of rating corresponds with the variation in fuel efficiency ascribed to motors, according to their number of cylinders.

Now, assuming this to be correct, I would like to have you tell me what share in this loss of efficiency, due to an increased number of cylinders, comes under the head of greater thermic losses—due mostly perhaps to the smaller sizes of the cylinders—and what other share must be ascribed to proportionately greater mechanical friction?

At this juncture, when the question of fuel economy is so prominently before the public, it would seem to be interesting to know through what necessity it is that we so freely consent to waste fuel at the bung-hole—the multicylinder construction—while striving assiduously to save it at the spigot—the carbureter.

For example, is it just to avoid the heavy flywheel and the old familiar chug-chug that we put four-cylinder motors in our heavy trucks, or is it possible to demonstrate a reduction of the wear and tear through the use of the four-cylinder type: a reduction compensating for greater first and maintenance cost?—MAURICE C. CROSBY.

Temperature Excites Unusual Interest

WORCESTER, MASS.—Editor THE AUTOMOBILE:—Professor Jones in your issue of December 26, 1912, asked "What the temperature of a cylinder is" and for his benefit I will state the following: The temperature of an automobile engine cylinder is a variable quantity, depending upon the particular point in question and the condition of operation. No definite value can be

given. It may be illustrated, however, by the accompanying sketch, Fig. 1—D. L. GALLUP.

Flame Propagation Considered

NEW YORK CITY—Editor THE AUTOMOBILE:—In THE AUTOMOBILE for December 26, Professor Jones seems to think that it is possible to determine the temperature of the gases in the cylinder at any particular time or period of the stroke. If the specific heat of a gas did not vary when its temperature was raised to the extent as is the case in exploding, it would be of course a simple matter to determine that temperature. Again if the temperature were maintained for any length of time, it would be possible to determine it by simple calorific measurement. As it is such a thing is impossible. Besides the difficulties thrown in the way by the impossibility of determining the specific heat the ever changing wall temperature and the stratification that might possibly exist within the cylinder are also impediments. From our knowledge of flame propagation it must be that different temperatures exist in different parts of the combustion space at the same time. When the charge is first ignited at the spark plug, one particle of gas is fired. This particle ignites its neighbors and we can readily imagine the flame spreading away in the shape of a hollow sphere except where bound by the cylinder walls. The progression of the flame must necessarily mean that as each particle is met it is raised to the igniting temperature and therefore it is impossible to state that any one given temperature exists in the cylinder at any given time. Countless experiments have been made to determine the temperature within the cylinder at different points and the results of these experiments have been anything but uniform. The artificial circumstance of cooling water circulating about the walls and of this water being of different temperature at different points alone would throw out any results that were obtained from a purely theoretical calculation. How much the charge is preheated on entering the cylinder by coming in contact with the heated walls also interferes with the chances of making a successful determination of the temperature value.

All that we can approach with any hope of success is an average value of explosion temperatures for even the mixture varies with every stroke.

I would like to see the views of others in THE AUTOMOBILE as I believe this is a subject of interest to all designers.

Oakland, Cal.

J. E. SHEPARD.

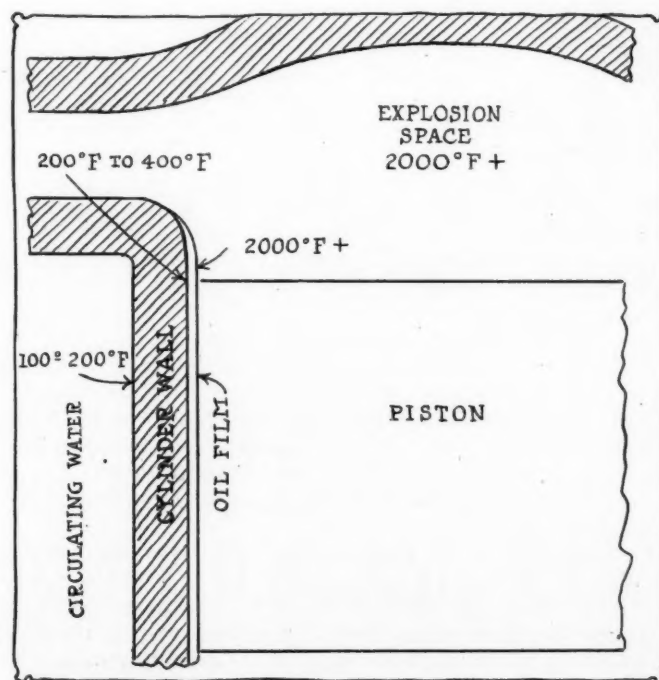
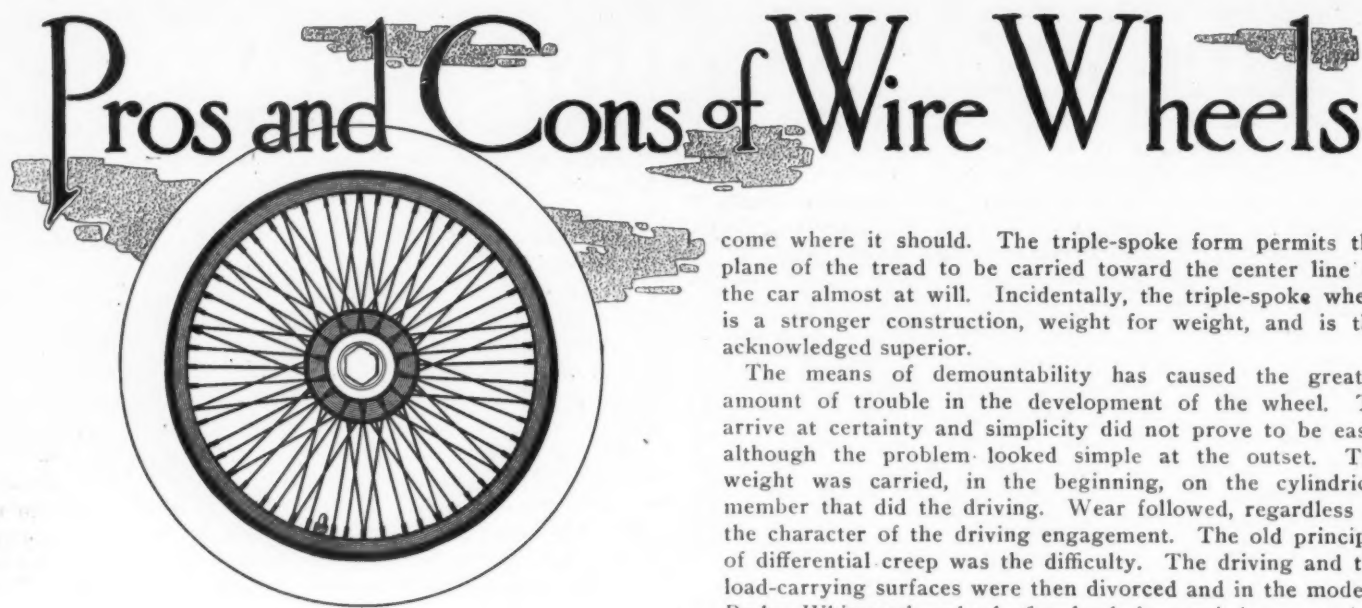


Fig. 1—Diagrammatic illustration of cylinder temperature



Engineer Outlines History of Wheel Development—Compares Wood and Wire Constructions

Cites Arguments Why Wire Wheels Ought to Be Introduced

PHILADELPHIA, PA.—Editor THE AUTOMOBILE—The idea seems to exist in the minds of the public and some engineers, too, that the wire wheel of 1913 is just the same, so far as use on automobiles is concerned, as the wire wheel of 1901.

As regards tire-saving qualities and resilience, this is so. That is, in principle, the wheels are the same in the fact that the axle is supported by wires from the top half of the wheel instead of being supported on wooden struts in the lower half of the wheel.

Here the likeness ceases. The wire wheel of today has been evolved by the Rudge-Whitworth company and their licensees in Europe until it is capable of carrying the load imposed by modern automobiles at any speed. The load and speed factors of today are very different from those of 12 years ago.

This firm has been for many years bicycle manufacturers, and now also makes motor cycles and wire wheels. With all its wire wheel experience in connection with bicycles, it did not succeed the first time it tried in making a perfect automobile wire wheel. The troubles were soon cured because of experience, however, and after 6 years' use in Europe the wheel is looked upon as being without a peer.

There are two elements in the modern wheel; one the structural wheel form, that is the rim, spokes and outer hub; the other the means or device to permit demountability and secure locking onto the hub. Both have been through a series of evolutionary steps, and always toward simplicity. The modern wheel is decidedly more simple than any of its predecessors.

As to the spoke construction, two forms are available. What is known as a double-spoke, Fig. 1, and triple-spoke, Fig. 2. With the double form of spoking it is not possible to put the plane of the tread of the wheel as near the center line of the car as with the triple system of spokes. The double-spoke wheel is still in use on such cars as have so modified their design as to permit the tread of the wheel to

come where it should. The triple-spoke form permits the plane of the tread to be carried toward the center line of the car almost at will. Incidentally, the triple-spoke wheel is a stronger construction, weight for weight, and is the acknowledged superior.

The means of demountability has caused the greater amount of trouble in the development of the wheel. To arrive at certainty and simplicity did not prove to be easy, although the problem looked simple at the outset. The weight was carried, in the beginning, on the cylindrical member that did the driving. Wear followed, regardless of the character of the driving engagement. The old principle of differential creep was the difficulty. The driving and the load-carrying surfaces were then divorced and in the modern Rudge-Whitworth wheel the load is carried on conical surfaces at the two ends of the hub. These surfaces are at an angle which permits tightness without any tendency to seize.

Many different forms of locking devices are used in Europe where the wire wheel is so much in use. Most of them consist of some form of ratchet and pawl, or series of holes and spring-operated pin, or serrated teeth on a spring-operated nut. They operate well enough but are sometimes injured by slight accidents and give more or less trouble from clogging with dirt.

Discussion has arisen as to why a wire wheel is easier on tires than a wooden wheel. This feature was not anticipated to any such extent as has proven to be a fact in experience. Companies renting cars in England have actually found out that the tire mileage on cars equipped with wire wheels is greater by 50 per cent. or more than similar cars equipped with wooden wheels. These renting companies have looked into this matter carefully because of the saving in car upkeep. Every dollar saved in connection with a car rented is a dollar earned. Racing men have found out by experience that their tires stand up better at high speeds on wire wheels than on wooden wheels, and they have also learned, incidentally, that the tire change is made much quicker by demounting a wheel than by demounting a rim.

It seems to be a well-acknowledged fact in Europe that the wire wheel is more resilient and a tire saver. This being accepted as a fact it becomes interesting to study the causes. They are several: First, weight; second, elasticity; third, heat radiating properties.

On the subject of lightness, it is certain that a car equipped with six wire wheels, two being spare wheels, is 100 pounds or so lighter than a car equipped with six wooden wheels with demountable rims.

More important than this, probably, is the fact that the weight in the wire wheels, immediately in contact with the tire, where it can do most harm, is very much lighter than the weight immediately in contact with a tire mounted upon a demountable rim. It is an acknowledged fact that the demountable rim punishes tires because of the unusual weight continually pounding directly on the tire. It is for this reason that the demountable rim on a wire wheel is seldom seen in Europe.

The demountable rim would subtract from the benefits to be derived from it in several ways: By increasing the weight immediately in contact with the tire, by decreasing the elasticity of the rim, and by decreasing the flow of heat from the tire and also by increasing complication of changing tires.

The light weight at the rim in a wire wheel facilitates starting and stopping, because the flywheel effect is minimized. This the racing man appreciates and some users of wire-wheel equipped automobiles believe that they can tell the difference in the way cars "get away."

The second point is that of elasticity. In the wire wheel the weight of the car is supported by the spokes in the upper half of the wheel. The axle is suspended in the wheel. When heavily loaded, therefore, the spokes in the lower half of the wheel are relaxed. The result is freedom from stone bruises or bruising injury of any kind in connection with the tires. The explanation must be that a wire wheel coming in contact with a sharp stone, brick or edge of a pit hole in the road the rim and lower spokes yield more or less and cushion the blow. It is not probable that the lower spokes actually buckle or bend because that would loosen the spokes and crack the enamel. This does not happen in properly constructed wheels; yet there must be sufficient yield in rim and spokes to ease materially the bruising action of the wheel. This point is brought out in Fig. 4, in which the solid lines show the spokes that are in tension, supporting the car load, while the dotted lines represent the spokes that are comparatively relaxed.

Take the wood wheel in contrast, Fig. 3, which may help to make the matter clear. Therein the load is supported upon the spokes in the lower half of the wheel; the upper spokes are idle. And as a wooden post makes an ideal strut to support a load, it follows that the wooden spokes in the lower half of the wheel transmit the blow from the road surface to the hub of the wheel and to the springs and body much more readily and severely than the wire spokes which are manifestly very bad struts and incapable of sustaining compression loads. Inasmuch as the wire wheel is easy on the tire, it is similarly easy on the whole car.

Following this thought, it is common knowledge that solid rubber tires are much harder upon a car than pneumatic tires. The solid tire and its rim will not absorb the road shock at the place where most good is done, that is to say, at the road surface before the shock reaches springs or any other portion of the car. Similarly, the wire wheel is more resilient and elastic than the wood wheel, and consequently the wire wheel is actually easier on the automobile. This superior resilience, therefore, saves tires, the automobile structure and the passengers.

As to strength, the wheel is not only more resilient than wood but it is capable of carrying heavier loads and of resisting side-thrust, as in a skid, to a much greater extent than a wooden wheel. This is true in well-proportioned wheels only. A wood wheel resists only a very slight blow, comparatively, in the direction of the axis of the wheel. This applies particularly to wooden wheels of large diameter.

The third element is that of heat. The relative importance of this element is hard to prove. That it amounts to something is pretty well acknowledged by those who have used the wheels for the last 5 or 6 years. Racing men are particularly certain on this point, and it would seem that they ought to know inasmuch as the heat element in the endurance of their tires is an important consideration. The explanation is not so easy except that it is well known that wood is a bad conductor of heat. The metal rim of a wooden wheel is largely covered by the wooden felloe and, therefore, pretty well insulated against radiation. The wooden parts do not carry away any of the heat. On the other hand, the whole of a wire wheel is metal and takes away the heat from the rim which is immediately in contact with the tire.

There is a certain prejudice against carrying spare wheels as compared with carrying demountable rims, but experience in Europe indicates that it is a prejudice without foundation and that it is quite as easy and convenient to carry one or two spare wheels as demountable rims. Suitable

devices have been evolved so that there is no complaint at all on that subject among those who have used the wire wheel. As to convenience of demountability in case of tire trouble, there is no question whatever. The one simple nut of the Rudge-Whitworth wheel, for instance, may be removed much easier than any one of the six or eight nuts involved in the popular demountable rim. Moreover, there are no small treads to strip or become crossed or worn out. Many who have tried both methods are greatly in favor of the demountable wheel as compared with demountable rim.

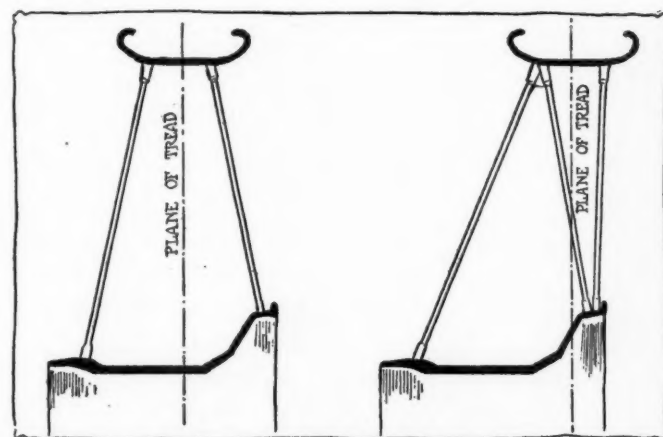
One device which is popular for carrying the spare wheels is an aluminum dummy hub bolted onto the car. Such hubs are made to carry either one or two wheels. The spare wheel is slipped onto the dummy hub and the locknut put into position. This holds it securely, keeps it clean and always ready for service.

In Europe, where the clincher tire with its security bolts (lugs) is still popular, the favored equipment for wire wheels is the soft-beaded clincher tire. In the United States it would seem logical that the popular equipment would be any form of inextensible bead Q-D tire, which means a Q-D rim on the wire wheel. The lightest possible Q-D rim must be used in order to get full advantage in tire saving.

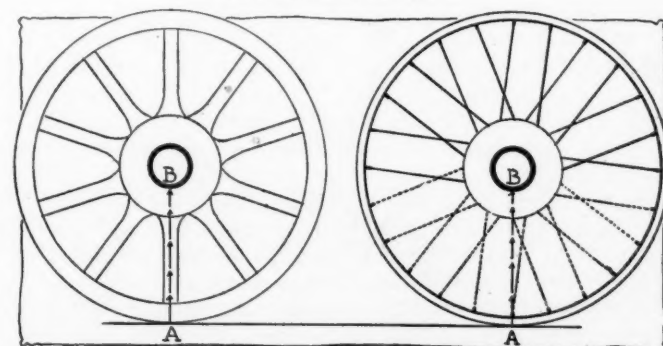
The speed qualities of wire wheels are well brought out in the records made on the racing track at Brooklands, England, up to the end of 1912. All the records between 85 and 98 miles per hour were run on Rudge-Whitworth wheels. The long duration records from 12 to 24 hours were also made on the same type of wheel at sustained speeds in the neighborhood of 66 miles per hour. These performances were shown graphically in the form of a chart published in the January 23 number of THE AUTOMOBILE.

HENRY SOUTHER.

The Automobile invites comment on pertinent wire wheel topics.



Figs. 1 and 2—Double and triple-spoke wire wheels, showing position of tread in each case



Figs. 3 and 4—Showing effect of blow delivered at rim of wood and wire wheels

Ford Motor Company

REPAIR ORDER
INSTRUCTION CARD

No. **14**
(O.D.T.)

DATE 191

MOTOR NO. MODEL

CAR NO.

DELIVER TO

CHARGE

INSTRUCTIONS

SHOP CARD (TRIPlicate)
TO BE ATTACHED TO JOB IN SHOP AND RETURNED TO OFFICE
FOR FILING WITH, WHEN JOB IS COMPLETED.

Fig. 1—Copy of repair order blank on cardboard, used by Long Island branch of the Ford Motor Company and kept on file in the office of the plant manager

Ford Service System

Building and Service Scheme Used for Supplying Metropolitan District with Cars and Repairs

Eight Principal Blanks Used—Factory Is Always Kept
Posted on Branch's Business—Details of Stock Room

THE service which the Ford Motor Company, Detroit, Mich., gives to the users of its products in the Metropolitan territory stands upon a relatively simple but effective system, designed to be carried out in the 84,000 square feet service building at Long Island City, N. Y. This building consists today of a basement, ground floor and two stories, each with a floor space of 21,000 square feet. The service building is not only a repair and storehouse for Ford cars, but also contains the offices of the New York branch, there being on Manhattan Island only the showrooms of the company. The Astoria building is divided as follows:

In the basement, chassis frames, motors and dashboards, etc., are kept, all the cars which are sold in the district around New York—between Philadelphia and Cambridge, where the nearest service stations are located—being built here, from parts shipped by the Detroit factory. The basement also holds wheels, rims and tires; furthermore, small parts, bolts, nuts, screws, etc., which are required in the work of assembling.

The ground floor contains the large showroom, the sales offices and a large space serving as a garage for the cars employed by the company and the automobiles brought in to be repaired or ready to go out. Furthermore, the checker's office recording every car which leaves the building, with the time of leaving, is on this floor.

On the second floor, stockroom and main office are located. The stockroom contains and delivers all material needed for repair work or replacement of parts. The stockroom also serves as the order department for outgoing repair parts.

Cars ready for shipment are arranged on the top floor, side by side, with 1 inch clearance between the mudguards. From the elevator on—which is stationed at one end of the building—the floor is divided lengthwise in two parts. On one side of the floor

is the repair shop and on the other the complete care are held until freight cars may be procured to send them to the dealers. Close to the end of the line of cars a small space for testing motors is reserved. The end of the floor is taken up by the body storage room at present.

Furthermore, the Ford company occupies a floor in the Galvin building, Long Island City, for finishing chassis equipped with motors, touching up scratched paint on bodies, and mounting the latter on the chassis, etc., until the car is ready to be returned to the main building, whence it is shipped to the dealers.

After describing the locality in short, the system used by the Ford company in its repair and stock departments will now be described. Besides the selling department, these two portions of the branch constitute the principal parts of the establishment.

The main stockroom, the basement stock for assembling work and the car and body stock on the top floor are under the supervision of foremen, and no part or car is permitted to leave its department except on an order signed by the foreman or his representative. Likewise, whatever work is done, is carried out in response to an order made out and sent to the specific department by the office on the ground floor. Only in this way is it possible to account for every minute of every workman's time and for every part which enters the building.

Accounting systems which cover work and material records are best described, in the case of automobile service establishments, by illustrating the way in which repairs are handled; as in this case, both material and labor expenditures and the forms for recording them, are involved. The forms used by the Ford plant include eight principal blanks, namely:

- 1—The repair order which is made out in triplicate;
- 2—Shop employee's daily time ticket;
- 3—Universal stockroom requisition;
- 4 and 5—Labor-and-material record form on the repair order;
- 6—Stock cards for parts, bins and stockroom file;
- 7—Quarterly inventory blank.
- 8—Unfinished repair work form.

In addition to these forms, which are described and illustrated below, the Ford service plant also uses purchase and credit orders, which, however, are very much like the repair order in design. The same applies to the parts-sale order form.

1—Triplicate Repair Work Order—This form is a blank, 9.63 by 8.13 inches and comes in form of a pad of consecutively numbered leaves. Two copies, orange and green, respectively, are printed on thin paper and the third copy is on light cardboard, Fig. 1, being printed on both sides. The light paper copies are printed on both sides, Figs. 4 and 5; the front, Fig. 4,

differs from Fig. 1 but by the printing below the double line, provided to facilitate bookkeeping, while the reverse side, Fig. 5, forms the blank mentioned above under (4 and 5). The card-board copy, Fig. 1, after the blank has been filled out downstairs, remains in that office for future reference. The orange-colored duplicate, filled out by a carbon with the name of the car owner, the number of the motor and that of the car and repair work instructions—along with the signature of the owner authorizing the repairs—is sent to the office upstairs and held for the bookkeeper until all the work is finished. The green triplicate, filled out, also by a carbon, like the other two copies, goes to the shop, where it is given to the foreman at the same time with the car to be repaired.

2—Shop Employee's Daily Time Slip—A duplicate blank, printed on thin paper, comprises the working time ticket used by all shop men. Besides this, every employee of the company rings in and out, on a time clock, to record the time spent in the building. The shop time ticket, Fig. 6, is 7.75 by 5 inches, both copies being printed on yellow paper. Every shop employee uses one ticket per day, marking on it his name and number, as well as the date of the day. Under job number the number appearing on the repair order is entered, while in the next columns is described the repair operation done by the man who fills out the ticket. This description indicates whether the whole operation outlined on the order has been done by him, or only part of it, without recording any more details than are necessary. The time used on the job is also recorded, together with the man's rate of payment. Copies of this form are O.K.'d by the foreman who keeps one and sends the other to the office.

3—Requisition for Getting Materials—Whenever a shop worker requires any sort and quantity of materials to do his work, he fills out the requisition, Fig. 7, which is the same size as Fig. 6 and comes in duplicate, both copies being blue paper. Under No. the number of the shop worker requiring the material is filled in, followed by: Please deliver to, where his name is filled in. In the following line, the repair job number and the name of the car owner, on whose machine the material is to be used, are entered. The part number and the quantity needed, as well as the name of the material are now filled in, the model for which they are required being mentioned also. When this requisition is brought to the stockroom, after the shop foreman has signed it, the material is taken from stock by one clerk who adjusts the record on the bin card; another rectifies the file record and signs under Entered stock cards; one of the stockroom clerks O.K.'s the delivery of the parts and signs under Entered repair order; while, finally, the shop man after receiving the material, signs under Received.

4 and 5—Labor and Material Record on Repair Order—By the use of Forms, Fig. 6 and 7, records are obtained of the labor and material used on every repair job. The foreman of the shop, after the job has been finished, takes all the records referring to it and appearing on the time tickets and requisitions and transfers the information contained in them to the reverse of his copy of the repair order, Fig. 5, which is then sent to the office, up stairs. The requisitions and time tickets are also sent into this office every evening, and a girl goes over these records and arranges them numerically, by the numbers of repair jobs and employees respectively. When the complete repair order is sent in by the foreman, the girl checks the time and material records against the back of the repair order, after which the bill is made out to the customer. Of course, the work done under the guarantee is taken into consideration when charging for work.

6—Stockroom Bin and File Cards—The stockroom of Ford service plant is especially worthy of comment. It contains a complete stock of all parts of all Ford models ever built, worth at present about \$225,000; about \$50,000 worth of stock is disposed of through the stockroom in 1 month. The system of handling these large quantities of material is unusually simple, but designed to work with an efficiency of 100 per cent. At the same time, it is so simple that this efficiency seems to be easy

to obtain. Only two forms are used in the stockroom. One is the bin record, attached to every bin in the stockroom and giving its exact contents. This card is shown in Fig. 8. It is 4 by 5 inches, printed the same way on both sides and ruled with red lines. On it are entered the number of the part in the bin—the part numbers on the model T start with 2,500—, bin No. 1 corresponding to the lowest part number of the current model. The minimum quantity to be kept in the bin, which, on an average is sufficient to last for 3 months, is also mentioned on this card. The maximum amount of stock is from 40 to 50 per cent. in excess of the minimum. Bin number and part name are also entered on the card. The column balance contains the number of parts in the bin, beginning with the number contained in it when the card is started, which is changed whenever material is drawn from or added to the stock. Under, Entered from, the number of the repair or selling order on which the material is sent out, or the credit or purchasing order with which it is brought in, appears. Fig. 9 is, in a way, a duplicate of Fig. 8, being a card kept in a file which is conducted separately from the bin record system. The file cards are adjusted from the repair and other orders which show what material enters and leaves the stockroom. Two clerks are continually checking bin against file card, and the date of the last check is noted on both cards. This insures correct records, as in case of a discrepancy, the contents of the bin are counted to arrive at a correct knowledge of the state of things. The file card, Fig. 9, is 7.75 by 5 inches, that is, twice the size of the bin card and each side is divided, a file card lasting twice as long as a bin card.

7—Quarterly Inventory Blank—Every 3 months the entire stock contained in the stockroom of the Ford plant is counted, piece for piece. The stock bin and file cards have been rectified, the information is transferred to the inventory sheets,

Fig. 2—Report on unfinished repair jobs sent every 5 days from branch to factory, Fig. 3—Sample blank of quarterly inventory book

which form books made up of loose leaves, Fig. 2. Each leaf is 9.25 by 11 inches, light green and punched to fit into a binder. Each set of leaves deals of the parts of one model, so that a small number of books give a complete statement of the stock of all parts. The inventory is made out with a carbon copy, the original going to the file of the branch office, and the duplicate to Detroit. The sheets of every book are, of course, numbered consecutively, and the list price is checked by the foreman of the stockroom, while the total value of all parts of a certain kind is calculated by a stockroom clerk; both signing their names at the top of the sheet. The total value of every sheet is footed, so that it is easy to calculate the total value of the entire stock.

8—Unfinished Repair Work Record—To keep the factory fully posted on the progress of repairs at Long Island, that service plant fills out, on every fifth day, a statement giving the repair jobs which are on hand, explaining how they are progressing and why they are not finished. The shop foreman and the manager of the plant O. K. this statement. By a glance, it is thus possible for the Detroit officers to see which jobs have been under way for too long a time, and must consequently be dispatched.

The system of sending a statement of the unfinished jobs, inventory and general statement of how things stand—a book-keeper's statement is sent to Detroit regularly—must necessarily prove of great value. The factory is kept posted by this system with regard to the state of the repair, reserve part and new-car departments and if it appears that any changes in the operating system are necessary, it is easy for the factory experts to detect this need.

A few words, regarding the promptness with which repair work is carried out and repair parts are shipped, may not be out of place. All orders are received, as above indicated, at the office on the ground floor. If mail orders for repair parts come in before 3 p. m., the materials are shipped the same day; otherwise on the following morning. In case a telegraphic order is received, it is filled immediately. Any order coming in is recorded in the office and at once forwarded to the stockroom. If a customer arrives with a car to be repaired, the car is at once put into the hands of a tester who determines what work should be done on it. After he has finished his work, the car is sent into the repair shop and the work started without delay.

One of the most interesting departments of the Astoria plant is the stockroom. It has been stated above that it contains complete sets of repair parts for all Ford models ever constructed and this is fully correct. When one considers, however, that this enormous mass of material—which, as stated before, is worth \$225,000 at present—is kept in shelves averaging 8 feet in height

and covering, including the passages between them, about 10,000 square feet, it becomes obvious that the strictest economy in space must be applied for this end. As a matter of fact, the Ford stockroom is a model in this respect. Wherever it is possible, the parts in each bin have been so arranged as to make the most of the available space. Excepting the cases of irregularly shaped objects, such as carbureters, etc., the parts have been built up in masses which fill 72.4 per cent. of the space on hand. Roughly speaking, it would take from twice to three times the space needed for an orderly array of the parts, if they be thrown or piled into the bins without any rule. The average space efficiency of 72.4 per cent. is utilized in the case of about 80 per cent. of the various kinds of material stored.

Name Part	Number of Parts	Cubic Feet Filled	Pieces per Cubic Foot	Space Efficiency Per cent.
Piston	700	28	25	78.5
Connecting rod	500	10	50	82
Axle housing halves.....	106	60	17.7	73
Rear axle halves.....	139	22	15.8	68
Transmission casing	32	25	1.28	80
Propeller shaft	110	15	7.35	66
Front springs	540	55	9.82	87
Rear mudguard	50	34	1.47	90
Front mudguard	20	34	.59	45
Wheel, 30 x 3.5.....	13	15	.87	48
Rubber mat, 2.5 ft. sq.....	72	7	10.3	96
Radiators	18	42	.428	70
Radiator hose, 2 x 2.5 ins..	1,950	12.75	153	98
Transmission clutchband....	940	18	52.2	73
Large ball race.....	2,000	4.5	445	79
Cylinder head gasket.....	1,324	9	147.2	80
Hub cap	1,250	4.5	278	97
Balls, 5/16	6,430	.4035	15,900	47.64
Balls, 3/4	6,500	.5044	12,900	47.64

Fig. 6—Time-recording form used at the Astoria branch

Fig. 4—Repair order blank printed on thin paper. Fig. 5—Reverse side of the thin-paper repair form, designed to take labor, material and outside-work records

On page 472 is a tabulation showing how much space is taken by materials of various nature, the number of pieces which may be stored in a cubic foot on a basis of average calculation, and the efficiency factor; that is, the percentage of the space used which is actually filled by material. All the examples here chosen represent the highest possible efficiency of practice under the circumstances obtaining in a stockroom of this nature. The parts referred to are, with very few exceptions, of the Ford model T.

The economy in space which may be attained by arranging the parts in the most orderly manner possible is easily illustrated by the following example: The 500 connecting-rods, fifty to each cubic foot, are laid in stacks. In each stack all upper and lower ends are arranged in the same direction and between alternate stacks, arranged in the same manner, there is one arranged in the opposite way, with the upper end fitting between the lower ends of the other two rows. This permits of bringing the rows very closely together, so that almost all the space of the bin is utilized. A number of connecting-rods in an adjacent bin were seen by the representative of THE AUTOMOBILE to be not arranged as yet, having been received shortly from the factory. In this case, the same space, that is, a full bin, was required to hold about 250 connecting-rods which were pyramided from the lower front up to the higher back edge of the shelf. It was only in this way that the tangled mass could remain in the shelf and it would have been impossible to fill up the bin completely without arranging the rods. But even if it would have been all filled up, it could not have held more than 400 pieces, necessitating a loss of space of 20 per cent. as compared with the orderly

[illegible]

Fig. 7—Requisition form used for drawing materials

arrangement. Similar instances obtained in the cases of a few other parts just received, which were most effective in proving *ad absurdum* the efficiency of painstaking order.

It should not be forgotten that the advantage of efficient use of space lies in space economy only. As a matter of fact, the saving in time in getting the parts from the bins and preventing material from being destroyed or scratched are also effective in increasing the advantage derived from an orderly arrangement.

It is generally in this department of an automobile service establishment that the efficiency manager has most opportunity to introduce improvements and reforms. The cost of introducing these is almost negligible when compared to the saving effected. Provided that the foreman of the stockroom has brains—without which he should not be made foreman—he can introduce the change either gradually or at one stroke. For instance, when stock is being taken. All that is necessary is to experiment in an empty bin with the various parts before dictating the most suitable arrangement to a boy or clerk. There cannot be laid down any rule for arriving at the most suitable arrangement, but common sense and a sufficient knowledge of stockroom problems must dictate the choice of the finally selected process. The first best method which seems an improvement over the old practice must not be chosen, but experiments should be continued as long as one can think of a new way. After noting the various ways, the best should be selected.

Thus, in the case of connecting-rods, it may be a question of laying the stacks in the bin, pointing from side to side or from front to back. Pistons are probably best arranged in vertical columns as high as the bin. Springs should be laid with the leaf edges in contact with the horizontal supporting surface, so that only two small spaces, one at each end of the bin, remain empty. Hub caps are advantageously kept wrapped in thin paper to them from being scratched and may well be placed within one another, forming horizontal rows which might be stacked upon each other to entirely fill the bin. Depending on the nature of the part, 50, 75 or 95 per cent. of the space may be utilized. In the case of such objects as balls, which automatically—so to speak—arrange themselves in the most economical manner, all that is necessary is to pour them into the bin or keep them in a box. Other small parts, however, such as fittings, are better arranged orderly. It is surprising, for instance, in how small a space one may crowd hundreds or even thousands of washers, nuts, etc., as long as they are kept orderly. The work of developing these improvements invariably pays, and, while it may sometimes take quite a while until a satisfactory arrangement is found, it is work which an able man will enjoy every minute.

[illegible]

Fig. 8—Sample of bin card used by Ford Company to record contents of a bin. Fig. 9—Blank used for the file records of the stockroom, duplicating on the bin records

Letters Answered and Discussed

Beautiful Tennessee Cave—High and Low Tension—Wants Factory Practice—Brush Carbureter on Oakland—Price of Ether—Balancing Fan Drive—Motor Knocks on Hill—Electric Resistance—Sign Inquiries

A Tip for Tennessee Tourists

EDITOR THE AUTOMOBILE:—I find it very interesting to read about and see pictures of places of interest to tourists. Mammoth Cave, Natural Bridge and others too numerous to mention have all been noted in THE AUTOMOBILE, but I have failed to see any one who has been to or heard of the tourist visiting one of the finest pieces of natural curiosity and beauty and grandeur in this whole country. We have 2.5 miles east of Clarksville, Tenn., on a splendid pike, a cave, not surpassed by the Mammoth Cave of Kentucky. It has a main entrance that you can drive four-horse wagons into, that extends for miles into the earth with the finest scenery one ever saw.

It has a large river, also pools with blind fist, ball room, senate chamber that glistens with diamonds and the grand entrance that has extending rocks which reach over a dancing platform that accommodates easily 250 couples. It has an everlasting cool breeze of about 60 degrees. Just over the bank there is an immense spring of cool water, pure and refreshing. The grove is as fine as you could find in any country. Then just .5 mile south is the famous Idaho Springs with three kinds of sulphurous water, iron water and others. These have been noted for years. There is a fine hotel with every accommodation. It is on the line from Nashville to Hopkinsville, Ky. This is the famous Bunbar cave, none finer in the whole South, none half so cool. Come and see it!

Clarksville, Tenn.

ED. C. BATES.

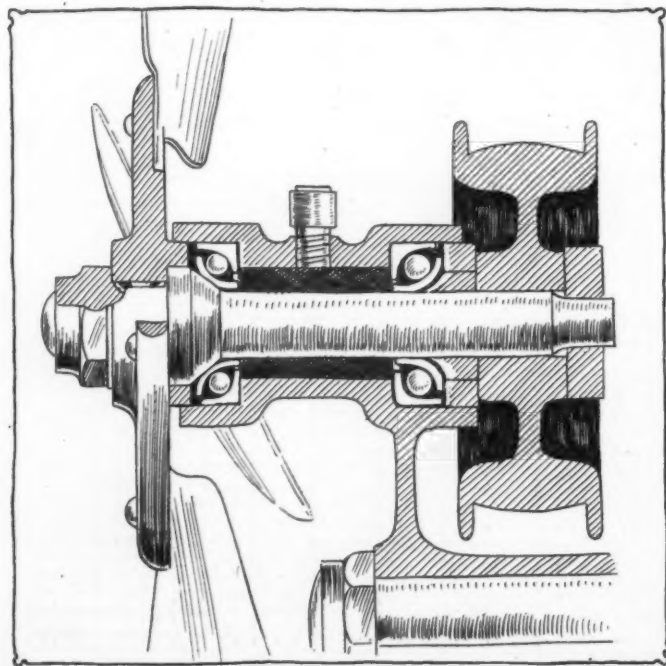


Fig. 1—Balanced fan drive; pulley and fan on opposite sides of bearing

High and Low Tension Magneto

EDITOR THE AUTOMOBILE:—Please describe to me the different action of a high-tension and a low-tension magneto.

2—Would a high-tension magneto be advisable on a 30 E.M.F. touring car?

3—Would equal parts of coal oil and gasoline put together be advisable to use on a motor car? If not, what would be the result?

Lodi, O.

W. A. BRIGGS.

1—The high-tension magneto is a low-tension instrument with a high-tension coil added. In other words, it combines two instruments in one. With a low-tension magneto, it is necessary to run the current through a high-tension coil, in order to bring it up to the proper voltage to deliver a spark at the plugs. With the high-tension instrument, there is both a primary and a secondary winding on the armature. In the low-tension instrument there is merely a low-tension or primary winding and the induction or transformation of the current from a low to a high potential is secured through an auxiliary coil unless a make-and-break or other form of low-tension ignition is used. In this case there is no transforming of the current to a sufficient pitch to make it jump a gap.

2—A high-tension magneto would operate to great satisfaction on an E.M.F. car. It would be wise to consult the manufacturers.

3—If you had a carbureter that would handle the mixture it would operate. The difficulty would be in getting started and after starting to vaporize the fuel with sufficient rapidity to meet the requirements of the motor. It is not impossible to use this fuel in motor cars and it would be almost safe to predict that in a short time we will be running on a lower grade fuel than this.

Wants Gas Engine Handbook

EDITOR THE AUTOMOBILE:—Kindly tell me if I can find a book of reference on automobiles that will give standard practices of the factories: 1—The amount of allowance made per inch of cylinder diameter in turning piston rings; length of pistons, connecting rod proportions, etc.?

2—I wish to know also if model 31 Pope-Hartford selling for \$2,250 is equipped with a Bosch dual or other make of magneto? Houston, Texas.

J. V. VAN VORST.

1—Standard practice in the automobile manufacturing business has not entirely reached the point where it can be laid out definitely in a book. The Society of Automobile Engineers which is standardizing work in this country wherever it is possible to do so have published a handbook in loose leaf form which is kept up to date by the society. This no doubt contains the latest information at the disposal of the average person. There are doubtless collections of private data which are unpurchasable. If you will study the car descriptions which appear from time to time in THE AUTOMOBILE, you will notice that although a motor may have the same bore and stroke as another, the piston length, the number and size of the rings and even the dimen-

sions of the bearings will vary to a great extent. For that reason it would be impossible to secure anything which would represent a definite and fixed standard for automobile work. There are many books on the market which give very good empirical formulas. These are no doubt correct as far as they go and may even represent average American practice along certain lines. With the unstable conditions that we now have, however, it would be impossible to state that any given book gave American factory practice unless it was in such shape that it could be appended or amended from time to time.

2—Although not fitted to the first lot of cars that came through the factory, the Bosch dual is now regular equipment on model 31 Pope-Hartford.

Oakland Change of Carbureters

Editor THE AUTOMOBILE:—Kindly answer the following questions regarding a 1910 model 25 Oakland:

1—What make of carbureter is used? Is there any needle-valve adjustment? It seems impossible to throttle down when the motor is idling although the engine works perfectly with the load on. I notice a pipe leading from the exhaust pipe to the carbureter. What is this pipe or does the carbureter take its main air from the exhaust? Do not see any main air inlet elsewhere.

2—What oiling system is used?

3—Could you trace the ignition system for me?

4—There is a sucking sound when the inlet valve of the second cylinder closes. The sound seems to come from the crankcase. What would cause this?

Quincy, Mass.

OSCAR WILBUS.

1—The Brush carbureter made especially for this car was used in 1910. Since that time the Oakland company has taken the Brush carbureter off and are now fitting the Schebler carbureter. According to the Oakland service department in New York City, you would save the price of the carbureter in a short time on account of greater economy, if you would turn your present carbureter over to the Schebler people and add sufficient cash to purchase a new carbureter. The pipe you see leading from the exhaust is an exhaust-pipe heated air inlet.

2—The Oakland car is lubricated by a circulating splash system operated by a piston pump.

3—The ignition of the Oakland 1910 cars is by the Remy type S, a wiring diagram of which is shown in Fig. 4.

4—This is due to a leaky bushing around the valve stem. You can secure one of these from the factory and simply drive it in place yourself.

Has Opinion on Proper Balance

Editor THE AUTOMOBILE:—In reading the engineers' opinions on four and six-cylinder motors in THE AUTOMOBILE of January 23, they claim the four-cylinder type makes more noise and has a great deal of vibration. As many fours are not designed as well as they should be, I think a four-cylinder Knight motor 4.5-inch bore and 7-inch stroke with cylinders offset could be designed and perfected to run smooth and noiseless as any six at 3 miles an hour on high gear and develop 60 to 70 horsepower on the road, if put on a chassis with 136-inch wheelbase with light weight body, would make an ideal touring car using one-third less oil, gasoline and tires, the body could be placed more in front of the rear axle which would give greater comfort in riding without having a long wheelbase that is so hard to turn around in many places.

Alton, N. H.

H. O. TIBBETTS.

Ether 35 Cents per Pound

Editor THE AUTOMOBILE:—In THE AUTOMOBILE for November 21, 1912, page 1063, P. C. Avery, Milwaukee, Wis., advises the use of ether in gasoline and suggests it can be obtained at a cost of 18 to 20 cents per pound. I would like to inquire where it can be obtained for about this figure, as the cheapest I have

obtained was 35 cents. Can you get a quotation of about 20 cents in New York City, and if so where, and in what quantity?

Westerly, R. I.

L. G. WAITE.

—Commercial ether sells for 35 cents a pound in New York City, and it is the opinion of THE AUTOMOBILE that Mr. Avery is low in his cost estimate.

Scraping in Main Bearings

Editor THE AUTOMOBILE:—In scraping in main bearings what precautions are taken in repair shops to maintain the shaft parallel with the bottoms of the cylinders?

2—In starting on the magneto, if the spark should be advanced to the limit, is a back-kick possible?

Boston, Mass.

A SUBSCRIBER.

1—A straight edge, a tightly strung piano wire or any other such means may be used. If the bearings are in a true line it is safe to assume they are correctly lined up with the cylinders and pistons. The wire is struck straight down the line of the top or bottom of the crankshaft and checked at various points along its length. A coating of oil may be given the bearings and a little tire talc sprinkled lightly on this. The shaft is then put in place carefully and lifted out vertically. The line of contact of the shaft may be noted in this manner.

2—It will be almost certain unless the motor is cranked at extremely high speed.

Balancing Belt Fan Drive

Editor THE AUTOMOBILE:—The belt on my fan is always pulling the fan out of line and I would like to know if there is any type of drive by belt that will not permit this to happen. I am using a plain bearing on the fan and I have ruined several bushings.

New York City.

H. A. DEWITT.

—Most cars have a balanced drive which takes care of this. In Fig. 1, is shown a balanced drive. It is only necessary to have the bearing surface long or a good space between the bearings. In the drive shown in Fig. 1 the fan is on one side of the bearing and the belt on the other. This is generally the case and it makes for good balance.

Asks Some Splash Questions

Editor THE AUTOMOBILE:—Would you kindly tell me the following:

1—In descriptions of a splash system I have heard of the

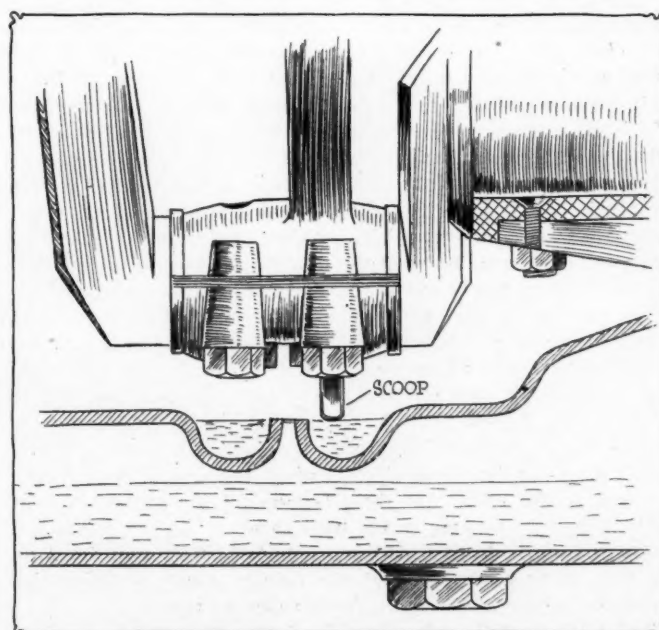


Fig. 2—Oil trough and oil reservoir, the upper small sump where the scoop dips is the trough, the lower part is the reservoir

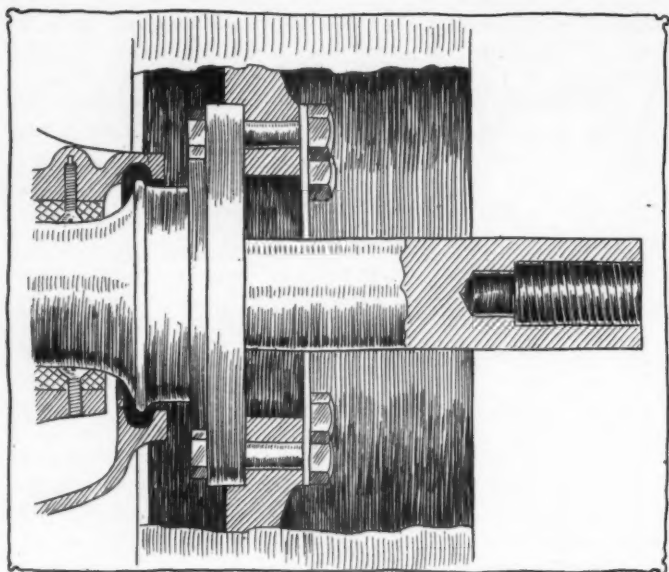


Fig. 3—Connection of flywheel to the end of the crankshaft

oil trough and the oil reservoir. What is the distinction?

2—How are the main bearings oiled in splash systems?

3—How is the flywheel generally fastened to the crankshaft?
Philadelphia, Pa.

CHAS. DRUMMOND.

—1—The difference is seen in Fig. 2. The upper is the trough and the lower the reservoir.

2—By a small pocket generally as is shown at A, Fig. 5. The oil collects here and flows by gravity to the bearing.

3—The flywheel connection is generally by six bolts through the flange on the end of the crankshaft. The practice of keying on flywheels is still used to some extent although the bolted-on type is most common. A bolted connection is shown in Fig. 3.

Engine Knocks on Up Grades

Editor THE AUTOMOBILE:—I have a four-cylinder touring car with a 4 by 4-inch motor. It is equipped with a Splitdorf magneto and Maxwell 1912 carbureter. The engine picks up very well on level ground, but when climbing a hill on high gear it does not take hold but dies right down with a knocking sound in the motor which sounds exactly the same as when traveling with a spark that is too far retarded. What is the cause for this and what is the remedy?

Spokane, Wash.

TROUBLED.

—There may be several causes for the trouble which you mention. When the motor is on a hill if there is any tendency to knock at all it is there that it will surely develop. The troubles which are commonly the cause of a knock that develops on a hill and which is not perceptible on level ground are as follows: Lean mixture, magneto set too early, valves seat poorly, carbon in cylinders, poor valve adjustment, loose wristpin bushing, loose magneto shaft coupling, sticking valves and piston slap. The cures for these may be taken up in order. They are as follows:

Lean mixture can be cured by opening the needle valve slightly or by closing the air valve. The former is preferable as it is easier to make a correct fuel adjustment than an exact air adjustment. This adjustment should be made on the road. Take the car out on a hill and run it up in the condition that it is at present. Return to the bottom of the hill and make a change in the mixture by turning the fuel adjustment. When this is done run the car up the hill again and note if there is any decrease in the knock. If there is none or the change is only slight it is time to pass to the next cause.

The setting of the Splitdorf magneto is explained in detail in the issue of September 19, and it is only necessary to follow the directions contained therein to secure perfect timing.

Bad seating of the valves may be due to two causes. Carbon or other foreign matter may lodge on the seats and prevent

the valves from seating properly, or they may be adjusted too closely so that they are not able to get down to the seats when the motor is hot enough to have caused the valve stems to expand. The latter would be apt to cause a knock on level ground as well as on a hill, however, and thus can be discarded from the list of probable causes. Carbon flakes on the valve seats are common, however, and may be the cause for the whole trouble. They can be removed by dosing the cylinders with kerosene or some other carbon remover and then turning the motor over to work the deposits out from around the valve seats. In case the valves are worn or pitted they will have to be re-ground.

Carbon in the cylinders is removed as just described. If patent carbon removers are used be sure to follow directions accompanying same.

Loose magneto shaft couplings are readily cured by tightening up the connections. Should an Oldham coupling be used in your car and it is found that considerable play occurs between the driving and driven faces, coat these with solder.

Sticking valves are caused by insufficient lubrication of the stems. A little oil will cure this trouble, which is not probable in your case as it would have been evidenced on level ground as well as on hills. Slapping pistons are due to excessive wear and are of such a nature that the repairs can only be made at the factory.

Electric Resistance of Wire

Editor THE AUTOMOBILE:—The claim has been made to the writer that there is a greater percentage of loss of current from 14-gauge wire than when 10-gauge wire is used for lighting purposes.

Kindly advise me of the percentage of loss in using 16-gauge, 14-gauge, 12-gauge and 10-gauge wire, 12 feet long, connecting a 6-volt storage battery with a 6-volt, 10-candlepower lamp.

New York City, N. Y.

L. M. SCHWARTZ.

—There will be a greater potential drop through smaller wire than there will be through large wire. This may be readily made clear to you if you will assume for the moment that your electric current is a quantity of water contained in a cylinder. Imagine two such cylinders, Fig. 6, with an equal amount of water and everything the same in every respect, except that one cylinder has a small orifice and the other a larger one. Suppose it is necessary to empty both the cylinders at the same rate of speed. It would be necessary to put a larger head or weight W_1 on the smaller orifice than W_2 on the larger orifice. It is the same with electricity. If it is desired to empty a battery at a certain rate where a certain pressure of voltage is maintained it is necessary to have at least a certain size wire. Below a certain limit it would be impossible to allow sufficient current to flow over the wire. It happened in the case of some

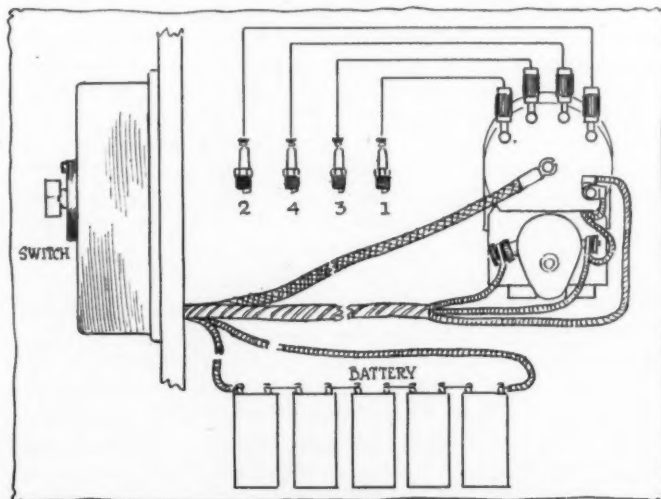


Fig. 4—Wiring diagram of the Remy type S, ignition system

6-volt lighting systems that the designer was not able to get a bright glow at his lamps. After a great amount of trouble it was found that the wire was so small that only 5 volts arrived at the lamp instead of the 5.75 volts required. The following table gives the allowable voltage drop per foot and also the voltage drop per ampere-foot of different gauge wire. In this table is also given the ohms resistance per foot. Knowing the amperes required, which may be secured from an ammeter or from the lamp manufacturer, and taking the ohms resistance from the table herewith, under the head of ohms resistance per foot, the voltage drop per foot can be calculated and compared with the permissible drop. The method of calculation is by the following formula:

$$C = \frac{E}{R}$$

In this formula C is the current in amperes drawn by the lamp, R is the resistance in ohms per foot secured from the table and E is the voltage drop per foot. In other words, the voltage drop per foot would be the ohms resistance per foot times the amperes. A glance at the volts drop per foot column will tell if this is in excess of the allowable number as per the Underwriters' requirements.

RESISTANCE OF WIRE			
B. & S. gauge	Allowable volts drop per ampere foot	Allowable volts drop per foot	Ohms per ft. at 20° C=68° F.
14	.00256	.0300	0.002521
12	.0016	.0265	0.001586
10	.00105	.0235	0.0009972
8	.000685	.0206	0.0006271
6	.000400	.0176	0.0003944
5	.000316	.0166	0.0003128
4	.000252	.0158	0.0002480
3	.000200	.0148	0.0001967
2	.000158	.0137	0.0001560
1	.000126	.0130	0.0001237
0	.000100	.0127	0.00009811
00	.000079	.0114	0.00007780
000	.000063	.0108	0.00006170
0000	.000049	.0101	0.00004893

Proper Place to Carry Loads

Editor THE AUTOMOBILE:—Given a motor truck carrying 5 tons of coal. The scales show 63 per cent. of useful load is on rear axle. How far back must body be placed so that rear axle will carry 70 per cent. useful load?

Length of truck overall.....	220 inches
Wheelbase	138 inches
Rear overhang.....	39 inches
Loading space back of driver's seat.....	160 inches
Length of body.....	160 inches

New York City.

F. J. M.

—Assuming that by useful load you mean the weight carried by the truck and not including the truck itself, the center of gravity of the load would be 80 inches forward from the rear of the truck or 41 inches forward of the rear wheels, by subtracting the overhang from 80, 80 being one-half length of load.

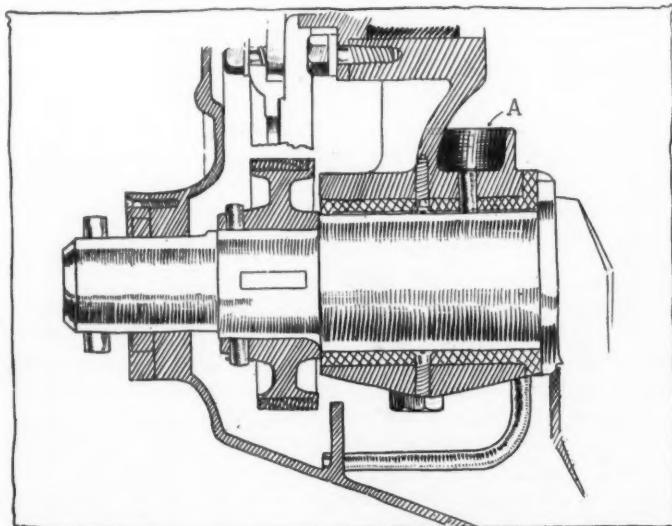


Fig. 5—Oil duct on top of main bearing, used with splash system

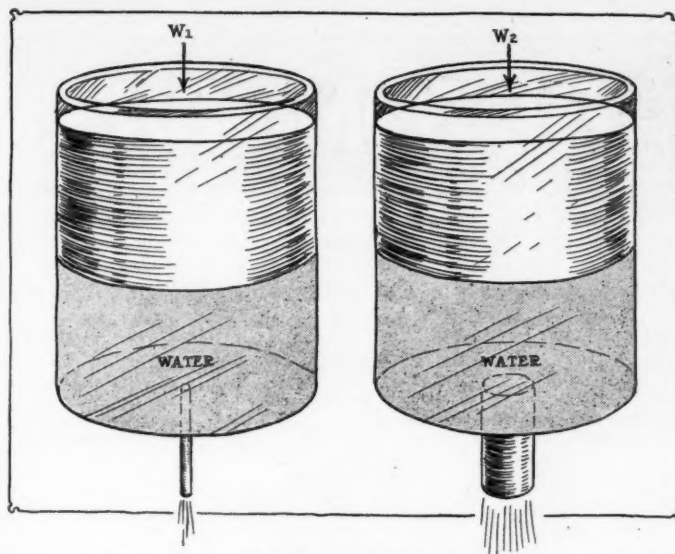


Fig. 6—Hydraulic parallel of small and heavy wire—a large and small orifice

ing space. According to your wheelbase, this would mean that the center of the loaded portion is 97 inches back of the front axle and that the weight on the rear axle as compared to the whole load—if the center of the loaded portion is the center of gravity—is as 97 to 138, or 70 per cent. Since you get but 63 per cent., the center of gravity of the load is evidently at present but 87 inches back of the rear axle and the weight will have to be shifted back 10 inches. It would be well to determine if you are correct first, and if so, why the center of gravity falls forward 10 inches when it would seem to be at the center of the load.

Small Manifold on Intake

Editor THE AUTOMOBILE:—I have a six-cylinder Napier car. The cylinders are 3.5 inches bore by 4.5 inches stroke. Will you be kind enough to advise me in your best judgment what size of intake manifold would work the best on this car. Also, what type of carburetor. There is a foreign carburetor on the car now, and it has a very small intake pipe.

Batavia, N. Y.

A SUBSCRIBER.

—You will have to keep the intake on your car that is now used upon it. The valve ports are of a definite area and the intake manifold has been designed to suit that area. The motor has a small bore and stroke and the small intake manifold is only to be expected. The number of cylinders on a motor does not affect the size of the carburetor at all. The reason for this is that the suction strokes of any two cylinders do not overlap. The carburetor that you now have on your car must be of the correct size as the Napier engineering department has a high reputation for its judgment in the design of the motor and its accessories.

Unless the carburetor is deranged to any extent, the best satisfaction will no doubt be secured from its use.

Please Sign Your Inquiries

[THE EDITOR OF THIS DEPARTMENT is in receipt of several letters signed Reader, Subscriber and by initials. No attention will be paid to anonymous or unsigned letters; readers who wish to make use of these columns must sign their letters as an evidence of good faith. No names will be published if the writer of the inquiry or communication does not wish the name to appear. It is only necessary to state this in your letter. Other letters which have not been deemed of sufficient general interest to publish in these columns have arrived without the sender's address so that it is impossible to answer them by mail. We are delighted to have our subscribers use these columns and most cordially invite correspondence, insisting only on the rules just mentioned.—EDITOR.]



Vol. XXVIII

Thursday, February 13 1913

No. 7

THE CLASS JOURNAL COMPANY

H. M. Swetland, President
 W. I. Ralph, Vice-President E. M. Corey, Treasurer
 231-241 West 39th Street, New York City

BRANCH OFFICES

Chicago—910 South Michigan Avenue Detroit—1501 Ford Building
 Boston—1035 Old South Building Cleveland—309 Park Building

EDITORIAL

David Beecroft, Directing Editor
 Donald McLeod Lay J. Edward Schipper
 Sydney Oxberry Hans W. Weysz
 L. V. Spencer, Special Representative, Detroit

Francis L. Wurzburg, Advertising and General Manager

ADVERTISING

L. G. Vogel, New York C. H. Gurnett, Chicago
 F. B. Barnett, Cleveland F. J. Robinson, Chicago
 W. S. Young, Boston C. K. Brauns, Detroit

Cable Address—Autoland, New York
 Long Distance Telephone—2046 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico—One Year, \$3.00
 Other Countries in Postal Union, including Canada—One Year, 5.00
 To Subscribers—Do not send money by ordinary mail. Remit by Draft,
 Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
 The Automobile is a consolidation of The Automobile (monthly) and the Motor
 Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903,
 and the Automobile Magazine (monthly), July, 1907.

Exhaust Gas Analysis

UP to the present little attention has been given to the subject of exhaust gas analysis as a means of determining carbureter efficiency and also motor efficiency, a condition largely due to the fact that fuel economy until the present has been little sought after by the car building companies, the major object being power or speed. It is not long since the custom was to make large cylinders, add to the bore and stroke, to get more power. Little, if any, thought was given to changing valve openings, altering valve timing, redesigning intake manifolds or reducing the internal frictions in order to get more power, because all of these were made unnecessary by the additional cylinder sizes. With the new longer-stroke motors, the increase in price of fuel, and the demand for lighter weight it has become imperative to secure higher motor efficiencies. Increased efficiency has been obtained by improved designs and constructions, but also by improved carburetion. With these demands for improvement has come the necessity for an accurate method of gauging conditions, and, while the various types of testing dynamometers and manographs have come into more general use of late, it is also true that the analyzing of exhaust gas analysis is also becoming more common.

Analysis of exhaust gases is a scientific method of determining if the combustion of the fuel in the explosion chamber is complete. It is a scientific method of determining if gasoline and air are being mixed in the required proportions to give the best combustion. It is also

a scientific method of determining questions of cylinder design insofar as the shape of the combustion chamber influences the thorough mixing of the air and gasoline.

Although exhaust gas analysis is receiving considerable attention at the hands of carbureter engineers to-day it is to be hoped that it will be kept in its proper perspective with relation to the various other methods of testing which are now in vogue. The dynamometer is needed; the manograph is imperative; it is necessary to have other test apparatus to measure the heat losses through the waterjackets; it is necessary to devise methods of measuring the loss due to friction of the internal moving parts of the motor; it is necessary to have methods of checking the condensation in the intake manifolds; and it is necessary to check the mufflers for back pressure; but while any one of these may force itself on the engineer at a particular time, that engineer will obtain the best results, who uses all, each in its proper place, and so has at all times a dependable balance wheel in his testing laboratory.

In order to bring exhaust gas analysis onto a practical basis THE AUTOMOBILE last autumn made a series of road tests with fifteen different makes of automobiles and trucks. These tests were conducted by a leading American university professor who was thoroughly conversant with the work. In all nine samples of exhaust gases were taken from each vehicle tested. The vehicles under test were put over the same road circuit so that it would be possible to make comparisons between different types of motors, cars, etc. The results of these tests will be published in these columns in a few weeks, and they should provide the actual information that the engineer and car owner wants.

This series of tests demonstrated satisfactorily the possibility of making such tests on a fully equipped car on the road. Collector tubes for the exhaust gases were the same as those used in laboratory tests and there was not the slightest difficulty in collecting the samples and analyzing them after the test was over. One leading American carbureter engineer has been conducting road tests of this nature for several years and he claims to obtain as good results as can be had in any laboratory. He even carries his analyzing apparatus with him and makes tests at different times during the same day over the same piece of road. One test is made with a certain carbureter adjustment; a second test is made with a slight variation; and third, fourth and fifth tests can be made after any desired alterations in carbureter setting have been made. Nothing could be more practical.

Greater fuel mileage is being talked of to-day from the Atlantic to the Pacific and the only means by which the engineer actually knows that he is obtaining complete combustion is by exhaust gas analysis. Careful tests will aid him in settling whether the loss in power is due to faulty carburetion or poor features in design. This, as one valuable motor test, should appeal to every engineer because of the accuracy of it and also because of the ease of performing it. There is not any guesswork and the test is made in actual road work, so that all differences between tests made in laboratories and those on the road are eliminated from the considerations. Carbureter makers will benefit greatly from such tests, because of the real facts such tests furnish. They furnish real facts because they are made under running conditions and not in a laboratory.

Executive Efficiency

Aptitude for the Task a Big Feature in the Ultimate Success Of the Boss or Workman

Inability to Calculate Wage Value the Source of Vast Money Losses

MORE than three-quarters of the industrial workers, including executives, do not have natural aptitude for the positions they fill. They are like dogs walking on their hind legs.

It is a simple matter to predetermine both the inherent ordinary and extraordinary capacities of any individual and to place both in positions for which their aptitudes will fit them.

The yearly money loss in direct cost on the average machinist of only 30 per cent. efficiency (not by any means an unusual standing) is nearly \$5,000; not counting the loss of profit on output.

This loss from inefficiency increases as the position becomes one of greater importance.

The industrial loss from the ill adjustment of workers to their duties is only a small part of the total loss. Ill-assorted marriages are a phase of bad adjustment, improperly educated children another.

The value of the individual who is competent increases far more rapidly than his market price. Even in rough labor, the kind of man an 8-hour day and 35 cents an hour pay can secure is more economical than the 20 cents an hour man, working 10 hours.

If positions were filled by men fit for them, if the wages were paid necessary to secure men who were fit, difficulties between employer and employee would be inconceivable.

In a long experience we have always found the so-called employer, the executive, at fault. He has filled the positions in his plant with ill-qualified men, because he did not know how to secure competent men, was not able to compute their wage value and was unwilling to pay any advance on the current rate to badly placed men.

The vocational counselor is, like the musician, born with an aptitude which can be cultivated and trained in a scientific manner, resulting in great skill. If either natural gift or scientific training is lacking, the result is mediocre.

A paleontologist can reconstruct, from a single tooth fragment, the animal to which it belongs, including its general disposition. How much easier is it from all the external indications of a living animal to determine its characteristics.

Since man reveals himself in many ways the animal cannot—by his clothes, by his handwriting, by the fatal gift of speech—it is remarkably easy for those who have supplemented natural ability by comparative study to read accurately all the natural aptitudes of any man or woman. For instance, since the brain, spinal cord and whole nervous system are formed from an unfolding of the surface skin, it of necessity follows that the texture of the skin indicates the texture of the brain and nervous system. Therefore in speaking of the character do we use the expressions "thick skinned" and "thin skinned."

As nearly all men lack standards, as many men mistake the effort of incompetence for the achievement of genius, we cannot be guided by any man's estimate of himself. The young are particularly given to taking up with what is distasteful because they enjoy the struggle, the effort.

It is therefore the position that should be given the right man, not the man who should receive the position he wants or likes.

The qualities required for the best administration of every position should be specified.

It is for this reason that some men succeed better in partnership than each did singly. The partners complement each other.

Aptitude is more important than experience. Men with aptitude can be given experience and they learn with extraordinary rapidity. A man with aptitude can learn a trade in a few months. A man without aptitude never becomes a skilled worker.

In giving a man of aptitude experience—that is, educating him—his own peculiar qualities determine the form of education which is therefore adapted to the man, the man not warped to suit the method of education. Some men learn through the eye, others through the ear, others through the muscles. Some learn best under one kind of a man and others under another kind of man. The fitting of man to man is as important as fitting man to position.

As a rule, those who are not identical but also not very far apart in temperament work better than those who are identical or very far apart. A trotting horse does better, not in double harness but with a running mate who is just a little faster. He would not succeed if harnessed either with a donkey or with a fast runner.

Our general plan for industrial employment should be:

1—To establish a thoroughly competent and complete employment department.

2—To employ, assign, transfer, promote and discharge solely through this department.

3—To specify the required qualities for every position.

4—To establish wage classes. The man belongs to the class in which his hourly rate locates him.

5—The rates for certain positions should be determined by the price that has to be paid to secure men of full qualification for the positions. We should vary the rate of pay to secure standard ability. We should not vary the requirements as to ability in order to adhere to standard rates of pay.

6—Full efficiency, full punctuality, full reliability for a specified period entitle a man to advance into the next highest class and corresponding change of work. The only limits to a worker's advance are the limitation of his own ability and the shortage of positions for which he is competent.

7—Failure to attain high efficiency is prima-facie evidence, not of incompetence but of bad placing. Bad placing is very rare if the employment department is competent.

8—The personnel of a man's surroundings are as important as the work. Personal aptitudes count for as much as work aptitudes.

9—The teacher and the teaching should be adapted to the learner.—HARRINGTON EMERSON in *Bulletin of the Efficiency Society*.

Eighty-Five Gotham Fire Trucks

Fire Commissioner Johnson, of New York City department, has just published his report for the past year. This report brings out the fact that the total number of fire cases increases during 1912, as compared with 1911, while the average damage done by each fire was 32 per cent. less in 1912 than in 1911. In 1911 there were 14,547 fires, with a total loss of \$12,470,806, or an average loss of \$855, while in 1912 there occurred 15,633 fires, averaging losses of \$580, and aggregating a total loss of \$9,069,580. The reduction in fire loss during the year 1912 was therefore \$3,401,226.

That a great deal of this saving is due to the efficient and speedy service given by motor trucks is illustrated by the fact that Commissioner Johnson has contracted for eighty-five motor-driven pieces of fire-fighting equipment, as follows:

2 hose wagons.....	\$8,326
16 combination chemical and hose wagons.....	105,170
3 high-pressure hose wagons.....	13,875
28 second-size steam fire engines.....	248,920
1 ladder wagon with 85-foot ladder.....	8,210
8 ladder wagons with 75-foot ladders.....	63,152
17 ladder wagons with 65-foot ladders.....	125,716
Total	\$573,369

Besides these contracts, the trucks of which will be delivered during the current year, others will be purchased.

Solid Tires

Treads Designed for Commercials

A Review of the Heavy Tires Now on the Market for All Weights of Vehicles

WITH the advance that has been made in automobile transportation in the last few years, considerable changes have been heralded from time to time in connection with solid tires. The recent show held in New York clearly demonstrated that tire makers are awake to the keen competition existing at the present time. While several prominent makers still adhere to the pressed-on type of tire as a regular standard, others have added a demountable tire or a block tire to their lines, thereby making the truck owner independent of the power press. With the new types of tires it is possible for the driver to change a tire in a short space of time, without even removing the wheel. There is still a large number of makers who manufacture the side wire or clincher type with cross wires, yet the metal and hard rubber base tire is favored by the majority.

The block tire has gained many adherents in the last year as is instanced by the number of concerns making this type at present. The adoption of the S. A. E. standard rim has been universal and if wheels are fitted with this type, it allows the truck owner to choose the tire he wants, without having to pay for having the wheels altered to suit a particular size of rim.

In order to present to the public the present offering of the solid tire market, a canvass was made at the show and the following is a brief résumé of the types made by the different makers who showed. This article does not deal with any of the mechanical types of tires, but only tires that can be termed solid.

Firestone solid tires, manufactured by the Firestone Tire and Rubber Company, Akron, O., are made in several styles. These include a hard-rubber base channel type; notched tread, con-

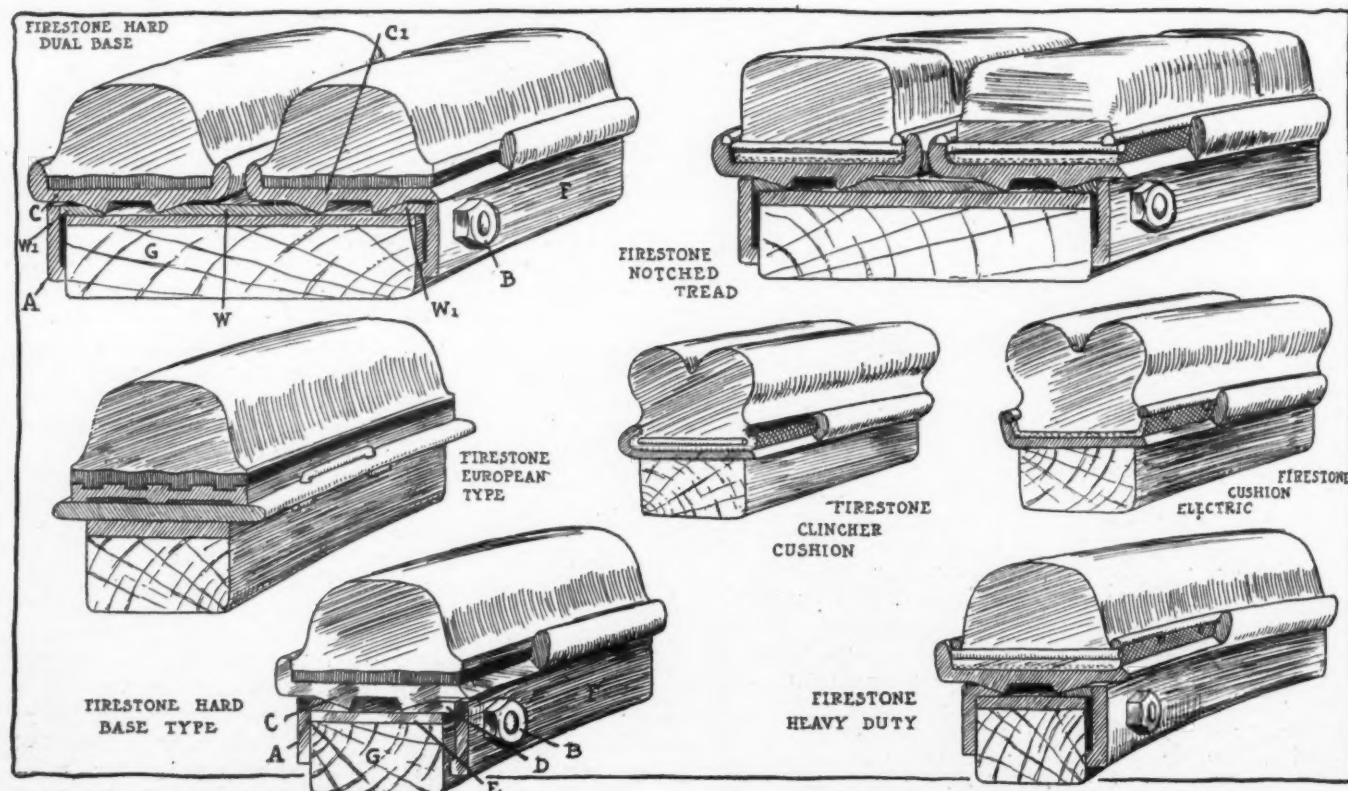


Fig. 1—Firestone solid commercial tires made in all sizes and styles to accommodate every weight of vehicle

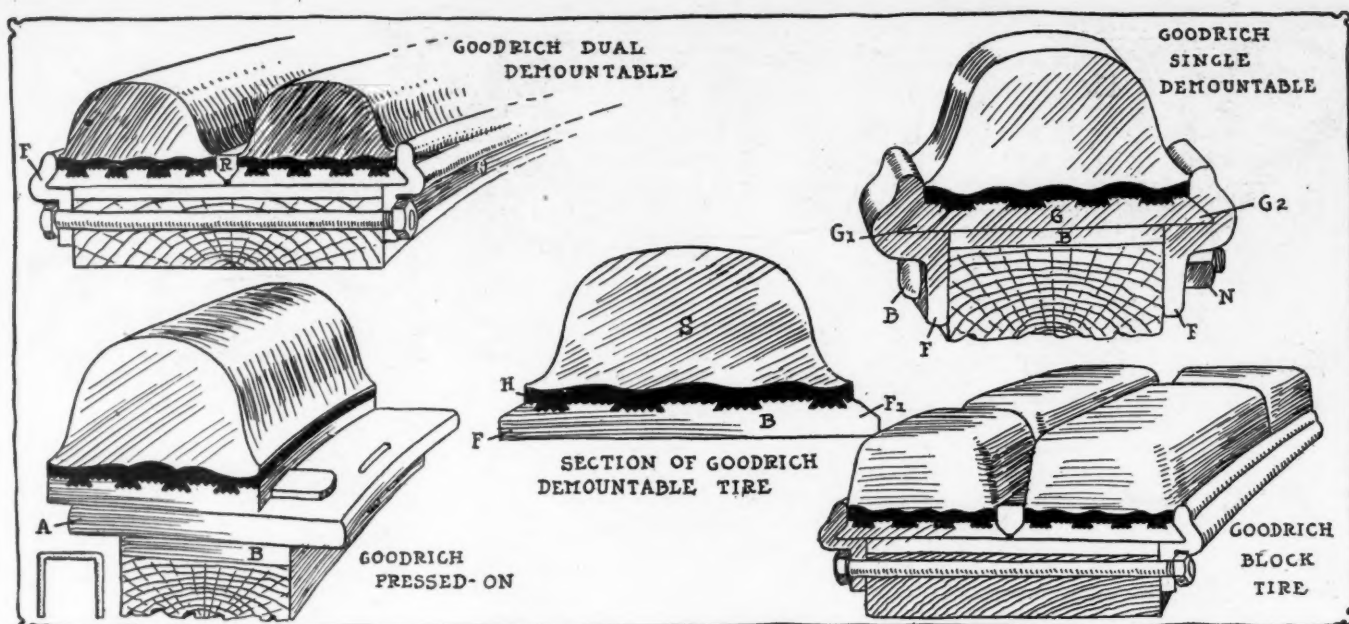


Fig. 2—Showing five styles of Goodrich solid tire for various capacity commercial vehicles

tinuous base, with side and cross wires; European type tire with steel and hard-rubber base, and a heavy-duty, side-wire tire, with plain tread. In addition to the above, the following tires are manufactured, especially for electric vehicles: a clincher cushion tire, a side-wire cushion tire and a special electric side-wire tire.

Dealing first with the hard rubber base channel type tire, Fig. 1, it will be seen that shape of the channel is intended to be used in connection with the Firestone quick removable rim. The inside of the base of the channel is serrated and a layer of hard rubber is interposed between the tire proper and the metal base. The sides of the tire are protected by the lips of the channel, thus preventing abrasion of the rubber through coming into contact with sharp protrusions such as curb stones or ruts. The illustration depicts a single tire as might be used on the front wheels and the quick removable feature of the rim for single tires can be seen. A steel ring E, is shrunk over the wooden felloe G and the flange A is then secured to the felloe by means of through bolts. The rim with tire attached is slid over the steel band E, butting at C against the wedge section of the inner ring A, finding a seat thereon. The steel ring D, hav-

ing a wedge face, is then placed in position supporting the rim from the opposite side and the wedge is forced home by the flange F and the nuts B.

A similar principle is employed in the dual removable tires, there being some differences, however, in the execution. In this case, Fig. 1, there are three wedges W, W1 and W2, the wedge W being independent of the flange A. The center wedge W1 is a sliding fit over the steel rim, and when the nuts of the flange are tightened, the outer wedges W and W2 force the rim on to the two sides, wedge W1.

The heavy-duty, side-wire tire of Firestone make is shown at Fig. 1. The tire is moulded on the rim, instead of being made endless and then shrunk over the lips of the channel. Cross wires are employed to assist the rigidity of the mounting. These tires are also fitted to removable rims as shown.

The construction of the Firestone continuous-base, notched-tread tires is shown at Fig. 1. In this instance it is fitted to a dual wheel and the construction is very similar to the heavy-duty tire just described. It is of the side-wire, soft-rubber base type, the base being endless as contrasted with the individual block type.

A cushion type of tire intended especially for electrics is also manufactured with either clincher or side-wire mounting, a section of these types being shown in Fig. 1. The European type of tire with steel and hard rubber base is made; the tire being pressed on to the rim under considerable pressure, held in position by a sunken key, and provided with wire staples to prevent side motion.

Goodrich wireless tire for trucks are manufactured by the B. F. Goodrich Company, Akron, O., in three styles, exclusive of varieties particularly intended for electrics. These are the Goodrich demountable type, block type and the pressed-on type. They are all of the metal and hard-rubber base type.

A sectional view of the demountable type, Fig. 2, shows the construction of the tire. The steel base B has a series of serrations and wedge-shaped protrusions on to which the hard rubber base H is attached. The base B has an undulating surface, the apex of the waves corresponding to the protruding wedges. The shape of the sides of the steel base F and F1 are worthy of notice here, as the method of attaching the tire is combined with this feature. Reference to Fig. 2 will make the reason of the taper clear. Before dealing with the method of attaching the tire, it must be stated that the steel base is not endless in the general accepted meaning of the word. It is slotted at three points, located at 90 degrees to each other; while at what would correspond to the fourth position, there is a key which fits into a

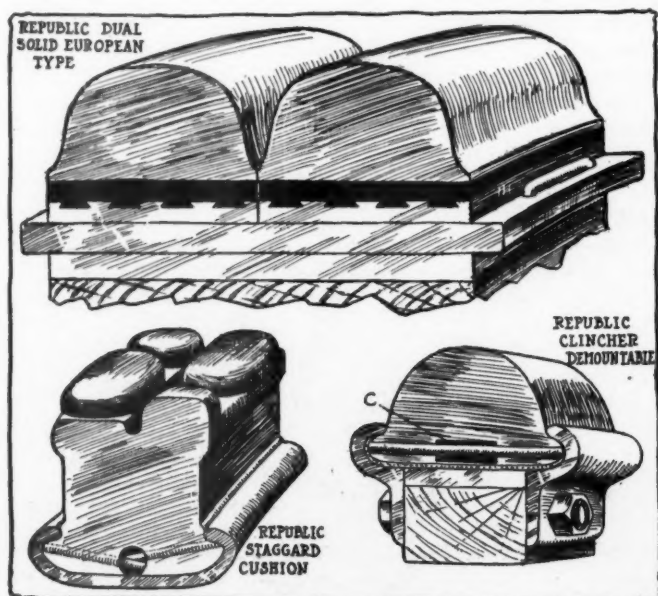


Fig. 3—Three styles of Republic solid tire

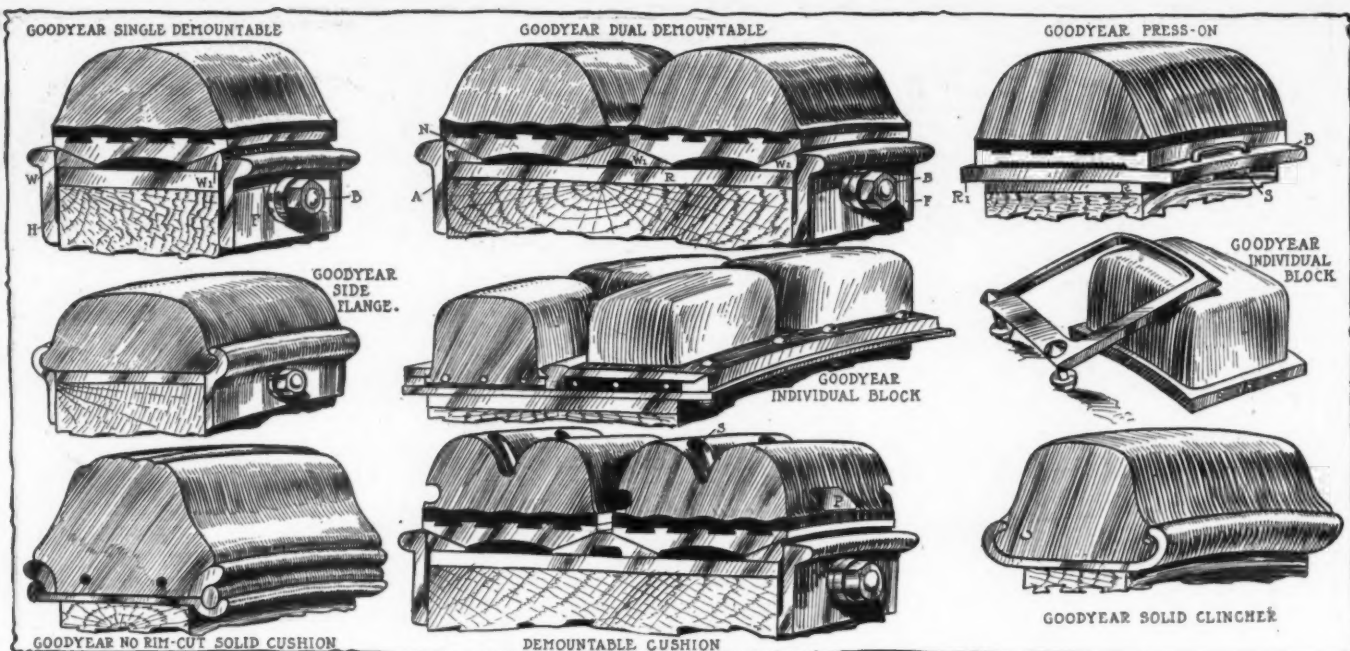


Fig. 4—The Goodyear solid tire output includes the complete line for all types of commercial vehicles

recess in the steel band and prevents the tire from creeping. By slotting the base as above described, it is possible to contract the tire over the band by tightening on the steel base with the rings F and F₁. The steel base of the tire fits into the grooves G and G₂ and when the nuts N of the through bolts B are tightened the tire is held rigid. It is claimed that the increase and decrease in circumference is so slight as in no way to affect the tire sub-base or tread. Fig. 2 shows the method employed for dual tires. The center ring R is endless. It is unnecessary to remove the wheel or the inner ring F to replace a tire, as everything can be removed after the outer flange has been taken off. A comparison of the block tire, Fig. 2, manufactured by the Goodrich company with their endless tire, Fig. 2, shows the principal differences. Each block has the same integral construction as the endless tire, but the blocks are individual and may be replaced and removed at will. The profile of the tire has been changed, this being necessitated by the construction. The blocks are placed end to end forming a complete tire, and applied direct to the permanent S. A. E. band. One block, known as the Key block, has a key seat which engages with the key on the felloe band. The initial application of the blocks is effected by holding them in position on the rim with a strap or rope while the outside flanges are applied. These tires are interchangeable on the same rims as the endless demountable type.

The method of applying the Goodrich pressed-on type tire is shown in the cross-sectional view Fig. 2. The intermediary rim A may be applied to the permanent S. A. E. band B or may be shrunk on the wood felloe without the use of the permanent band.

In order to provide a tire that will give low current consumption and at the same time give long mileage for electrics, a resilient compound tire has been placed on the market by the Goodrich company. The claim made for this tire is that it is not so soft that it will drag, nor hard enough to affect the batteries through causing excessive vibration.

Seven distinct types of tires are manufactured by the Goodyear Tire & Rubber Company, Akron, O., offering the purchaser a wide variety of choice. The various types are as follows: solid demountable; demountable cushion; solid metal base, pressed-on type; solid side flange; individual block; solid no rim-cut, and clincher truck tire. The solid demountable type, Fig. 4, belongs to the metal and hard-rubber base class. The metal base is undercut at an angle corresponding to the wedges W and W₁ which latter rest upon the standard S. A. E. rim R. By applying the flanges A and F and contracting them together by the bolt B

the wedges are forced against the rim. To take the tire off the rim, it is only necessary to remove the nuts and the outer rim and afterwards the wedge W₁.

The construction of the Dual solid demountable Goodyear tire rim differs only in the center wedge W₁, which is chamfered on both sides to accommodate the two tires. The tires intended for single and dual rims are identical, and are interchangeable.

The demountable cushion tire, as the name implies, can be removed from the permanent rim without the aid of a press. The sectional view, Fig. 4, shows that it is similar in base construction to the solid demountable just described, likewise the method of mounting. The tire has a dual tread, there being on the inner sides of the treads, undercuts as shown at S. These allow a displacement of the rubber and the double notches, besides having non-skid properties, offer increased traction. The undercut pockets in the sides provide for the displacement of the rubber, thereby adding resiliency. Fig. 4 shows a tire of the Goodyear cushion make in which the tread slots and base pockets can be seen.

The solid metal base Goodyear press-on tire is shown at Fig. 4. These tires consist of three strata, similar to the demountable types; namely, steel, hard rubber and soft rubber tread, but the shape of the base is different. In addition to the dovetails, the base is serrated to afford better gripping properties to the hard rubber. With the addition of a rim band R₁, this tire fits the standard S. A. E. rim R. Side motion of the tire once it has been pressed on is prevented by the staples. It will be noticed that the rim band R₁ is slightly bevelled at the sides at B forming a guide for the tire in the pressing-on process.

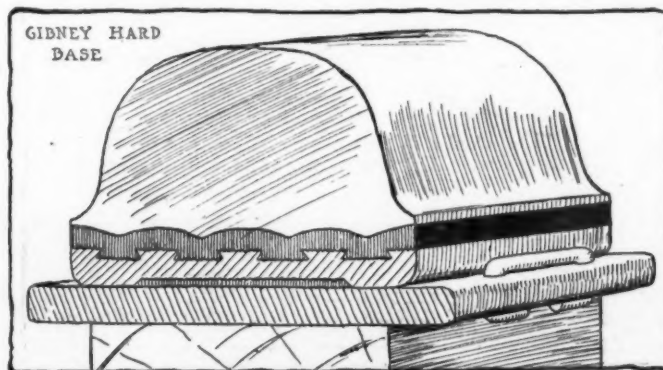


Fig. 5—The Gibney solid hard base truck tire

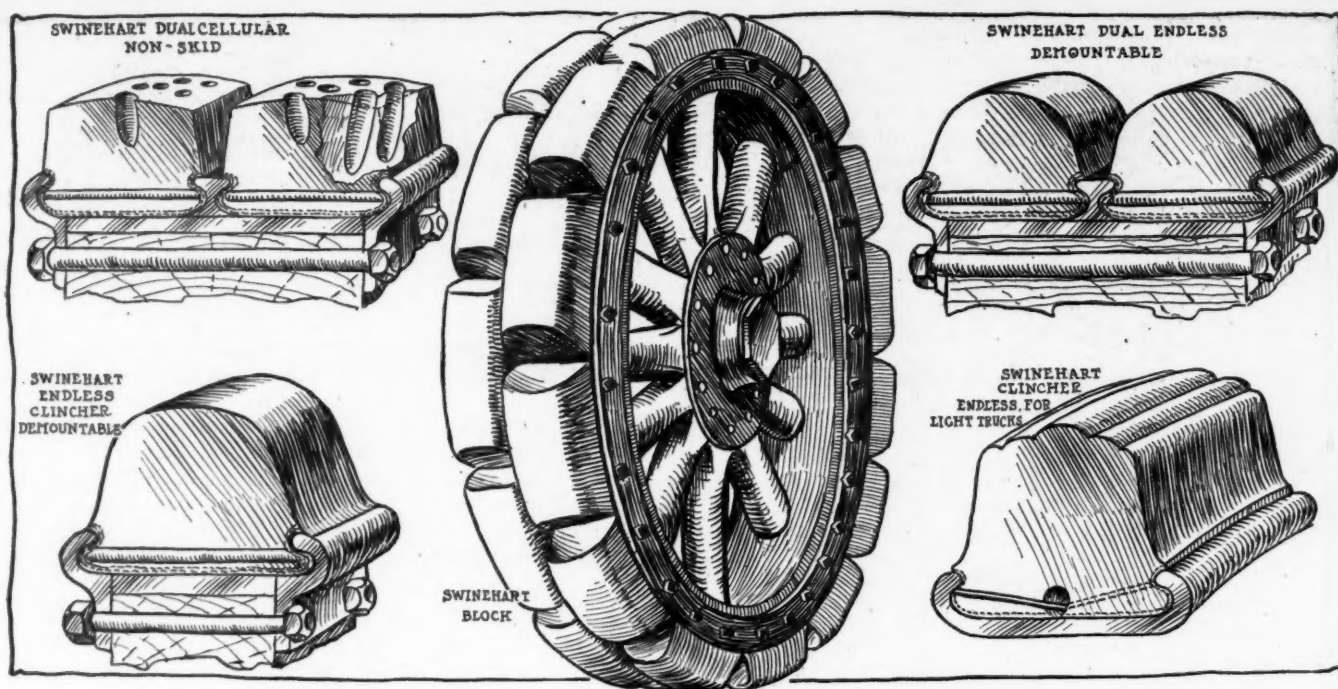


Fig. 6—Four styles of Swinehart solids and the block tread mounted on a wood commercial vehicle wheel

The Goodyear side-flange truck tire is made to the S. A. E. standard rim and side-flange specifications. A section of the tire fitted to a single rim is shown at Fig. 4. The cross wires or pins which are not shown run diagonally in the base of the tire, for which several advantages are claimed; one of which being that it is possible to tighten the side flanges and thereby increase the compression within certain limits, which would be impossible if the wire were placed straight across the tire. This tire, as can be seen from the illustration, has a soft-rubber base.

These tires can be used on dual rims, in which case a floating ring having a double clincher profile is used and placed between the tires. By tightening up the flanges the clincher sides of the tires are compressed into the four clincher grooves.

The Goodyear individual block tire is clearly shown in Fig. 4. Each block has a canvas base foundation, and the portion which is held by the metal clamps has three wires running through it parallel to the rim of the wheel.

Each block is an individual unit and is held in position on the rim by an individual retainer, the shape of block and retainer being seen in Fig. 4. It also shows a section through the tire. The sides of the retainers are bevelled at opposite angles, the inner one dovetailing under a ring placed in the center of the rim. The outside bevel rests upon a steel ring and both retainer and ring are held in position by two bolts for each retainer. In using this type of tire a separate rim is fitted over the standard S. A. E. ring.

The Goodyear no-rim-cut truck tire can be fitted to the stand-

ard Goodyear pneumatic rim. The sectional view, Fig. 4, shows that it is a soft-rubber base tire, as opposed to the hard-rubber base type, and there are two endless high-carbon steel wires running through the center of the base. The tire has concave sides. The method of applying the tire is similar to a pneumatic, except that it is necessary to use clamps to force on the inside ring B1 so that the locking ring L can be put in place.

The solid clincher truck tire can also be fitted to standard pneumatic tire rims either of the single-piece or demountable types. The section shows two wires, but these are not side wires. They run diagonally through the base of the tire and, being longer than the width of the rim, firmly wedge the base of the tire. The base is solid rubber and no machinery is needed in applying the tire. This is effected with a small hand tool supplied with the tires.

Kelly Springfield solid truck tires are manufactured by the Kelly-Springfield Tire Company, Akron, O., in five types, namely, the dual block or sectional tire; the endless S. A. E., new-type, single-block type; the side-wire type and the Langmuir endless type.

Considerable pioneer work has been done by the Kelly-Springfield company in connection with the block type of tire, having had this type on the market for some time. The rubber blocks are in single sections and have a reinforced base with three strands of wire running through it, Fig. 8. The blocks are held in position by retaining frames. The circumference of the rim is divided into three parts and these are placed over the blocks and held secure to the rim and wooden felloe by means of bolts with round heads.

The single-block tire is a new product of this company, and the method of mounting consists of two outside rings with a series of cross-bars placed between each block. The outside rings are fitted first and the cross-bars have bolts passing through them as well as through the main rim and the wooden felloe. This type of tire is especially adapted for low wheels.

Kelly-Springfield endless tires, a section of one being shown in Fig. 8, are of the soft-rubber base type with three endless wires passing circumferentially through the base. Side flanges hold the tire in position and prevent lateral movement; the wires are canvas covered.

The side-wire type, Fig. 8, differs from the endless type in the method of attachment. The base is formed with several layers of canvas imbedded into the rubber, above which are

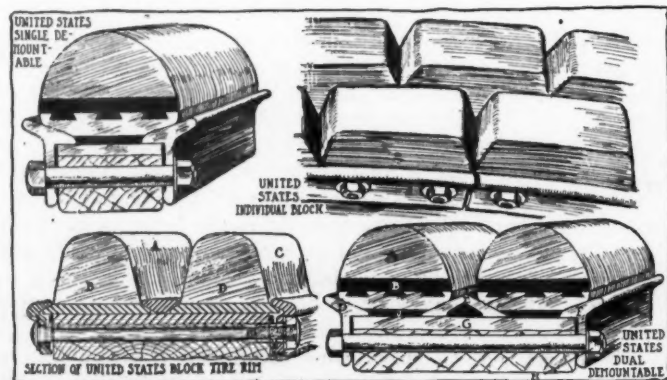


Fig. 7—United States line of some novel treads of great durability

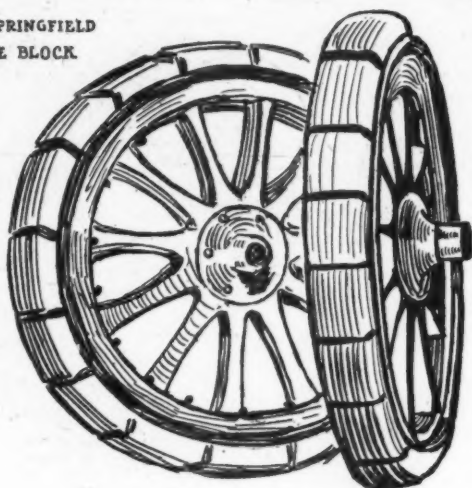
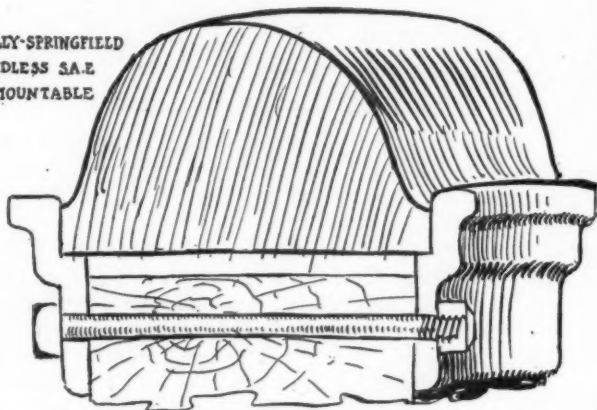
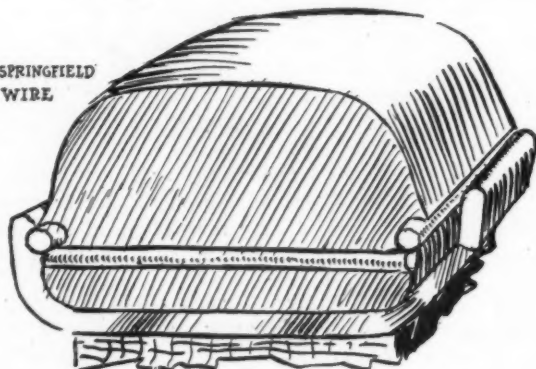
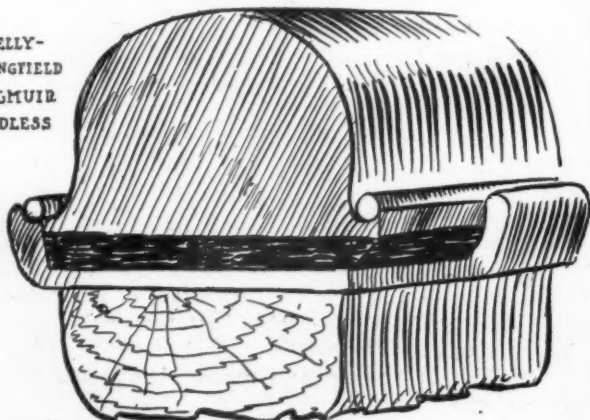
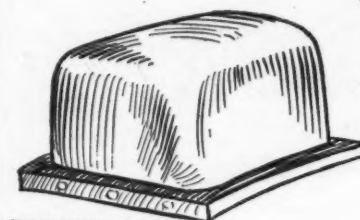
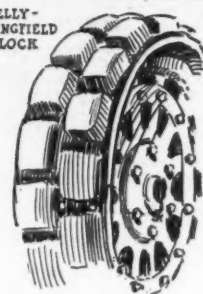
KELLY-SPRINGFIELD
SINGLE BLOCKKELLY-SPRINGFIELD
ENDLESS S.A.E.
DEMOUNTABLEKELLY-SPRINGFIELD
SIDE WIREKELLY-SPRINGFIELD
LANGMUIR
ENDLESSKELLY-SPRINGFIELD
BLOCKKELLY-SPRINGFIELD
BLOCK SHOWING
REINFORCED BASE

Fig. 8—Showing the Kelly-Springfield assortment of solid tires

cross wires at intervals. The tire fits into a channel rim and the bead is prevented from moving by side wires as can be seen by reference to the illustration. The Langmuir endless tire has a hard rubber and canvas base and is held onto the channel rim by side wires.

Gibney motor truck tires are only manufactured in the pressed-on type and are made by James L. Gibney and Brother, of Philadelphia at their factory at Conshohocken, Pa. These tires are of the metal and hard rubber base type, and a profile view of the tire is shown in Fig. 5. The tire is pressed on the standard S. A. E. rim and all slippage of the tire on the rim is prevented by a sunken key. It will be noticed that the sides of the tire are concave.

Up to the present, Motz cushion tires are made in various sizes, the largest of which is capable of being fitted to a truck having 2 tons capacity. They are made by the Motz Tire & Rubber Company, of Akron, O., which concern also makes a solid tire without the cushion features. The cushion or plain solid Motz tires are intended to be fitted to standard clincher or quick detachable rims as shown in Fig. 9. In the event that they are fitted to the Q. D. rim, a special tool is supplied to impress the rubber to permit the locking ring being removed, in the event that the tire is to be changed.

Excluding special tires manufactured by the Swinehart Tire & Rubber Company, Akron, O., for electric trucks, four distinct types are manufactured for gasoline trucks. These include the single and dual endless, smooth-tread tire, dual cellular non-skid tire, clincher endless tire for light trucks and the latest addition to the line, the continuous base block tire. The formation of the base of the solid endless and the cellular are identical as can be seen by referring to Fig. 6. These tires have cross wires running through the soft rubber base, which is covered below, and at the point of attachment to the side bead with rubber-coated fabric. The tires are intended for use on standard S. A. E. rims without any interliner. The clincher beads are gripped between the removable flanges, which latter are attached to the wooden felloe by a series of through bolts.

In the case of the dual tire, shown in Fig. 6 a center ring is employed having two clincher grooves. The cross wires pass well under the clincher rims thereby preventing the tire from pulling out.

The cellular tire shown in the dual form in Fig. 6 has a series of holes in the tread which form a suction grip on the road surface, besides allowing space for the displacement of the rubber thereby rendering the tire more resilient.

The new Swinehart block tire is of the continuous base type. It is demountable and is attached by means of side flanges, and fits standard S. A. E. rims without any special drilling of holes.

The Swinehart endless tire for light trucks is shown in Fig. 6. It is fitted to a clincher rim and has a series of cross wires placed at an angle from the lip of the bead to a point near the center of the base. The sectional view of this tire shows the construction clearly.

The Polack Tire Company, who recently has erected a factory at Bridgeport, Conn., is marketing two types of solid tires. These are known as the Polack European section tire and the Polack

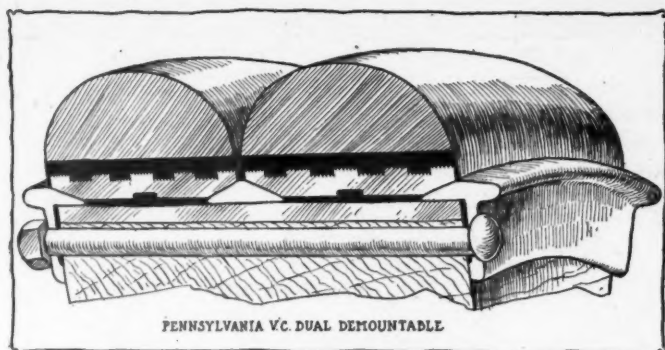


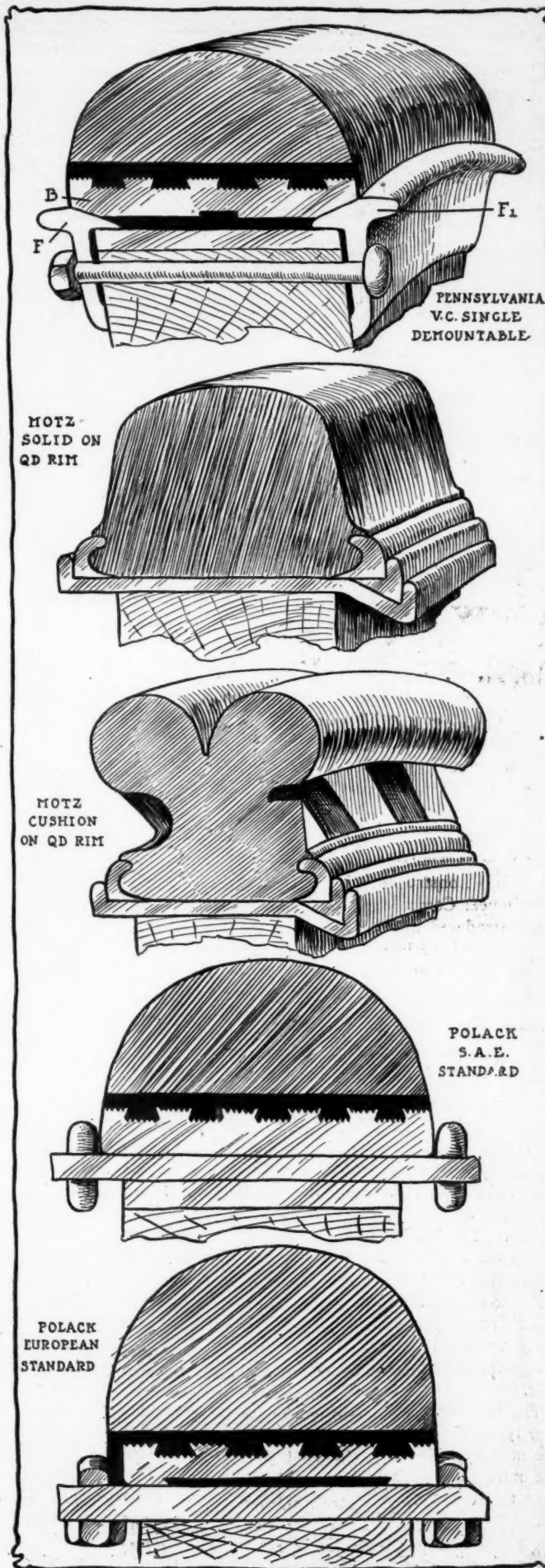
Fig. 9—The Pennsylvania demountable, Motz solids and Polack standard styles

S. A. E. standard tire. The sectional views of these tires in Fig. 9 show the principal difference between the two. The base is of steel and hard rubber in both cases. The European type tire is deeper in section than the S. A. E. standard which has a uniform sectional height of 2.75 inches. In the case of the European section, the hard rubber extends beyond the steel base on one side and all lateral movement of the tire on the rim is prevented by the T bolts shown. In this tire there is also a section of hard rubber beneath the steel, acting as a cushion. The S. A. E. section tire, of Polack make, is fitted to standard S. A. E. rims by interposing a liner between the rim and the steel base. Stout wire staples are used instead of T bolts to prevent lateral movement.

Pennsylvania V. C. motor truck tires are manufactured by the Pennsylvania Rubber Company, Jeannette, Pa., in the demountable form. They are of the hard-rubber and metal-base type. The section of the single tire, Fig. 11, shows the formation of the steel base B. It has a series of corrugations with serrated edges, on to which the hard rubber is moulded. There are also a layer of hard rubber on the under side of the rim that contacts with the permanent felloe rim. The tire is pressed over the rim and the steel B rides on the flange F, and when the second or outer flange is applied and tightened up, the double-wedge action on both sides holds the tire rigid. The flanges F and F₁ are wide and project in plain view beyond the edges of the tires thereby protecting them from abrasion. The section of the dual tire, Fig. 10, shows that the same wedge action is employed. In this case, the inner sides of the steels ride on the center floating wedge ring, enabling both tires to be removed without taking off the wheel. The outside width of the tire is exactly the same as the width of the felloe, thus obviating the tendency to spring the flanges outward. The width of the flanges in the dual tire are almost double that used in the single tire.

The line of solid tire manufactured by the Republic Rubber Company, Youngstown, Pa., includes the following types: a single or dual pressed-on type; a block type; single or dual demountable, and an electric cushion tire with a staggered tread. The pressed-on tire is of the conventional form with steel and hard-rubber base. The steel has a series of wedge-shaped corrugations with serrated edges, to which a thick section of hard rubber is moulded. The profile of the soft rubber tread is slightly concave, although not so pronounced as some other tire of this type on the market. The section of the dual pressed-on Republic tire is shown in Fig. 3, in which it will be seen that an intermediary band is used between the S. A. E. rim and the steel base of the tire. Wire staples are fitted to the sides and a sunken key is employed to prevent creeping. The demountable solid tire is of the clincher bead category, with cross wires that fit under the lips of the flanges. The cross section shows the method of manufacture of this tire and the attachment to the wheel. Running through the center of the base of the tire there is a hard-rubber core through which the cross wires pass. The base of the tire is covered with a series of layers of rubber.

(Continued on page 486)



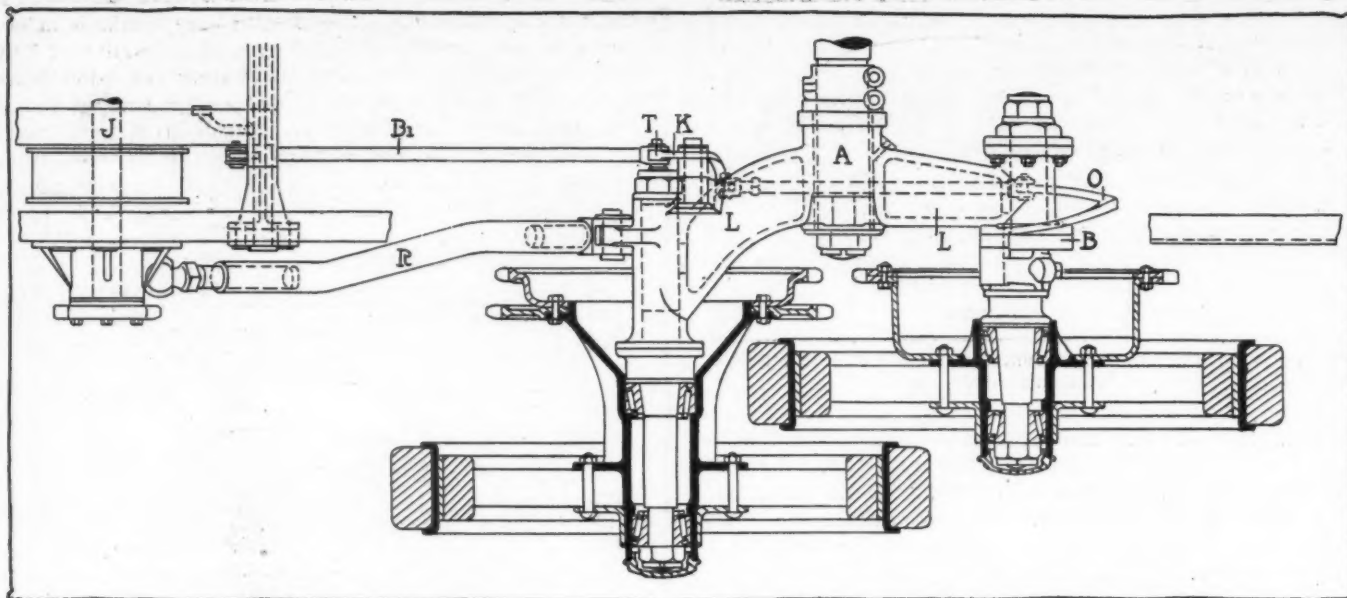


Fig. 1—Plan view of Dow dual wheel mounted on the rear end of a 5-ton Mack truck

Dow Dual Truck Wheels

Bogey Suspension Permits Use of Four Chain-Driven Rear Wheels with Many Advantages

Greater Traction, Lessened Depreciation and No Skidding Among Properties

INCORPORATING the principle of the Bogey truck with its various advantages, adapted to the requirements of freight automobile construction, the Dow dual wheel set made by the Dual Wheel Company, 1733 Broadway, New York City, is now being introduced in the truck market. The use of this wheel set includes a pair of levers having a wheel on each end and free to oscillate on the ends of the axle.

The Dow wheel is the invention of H. B. Molesworth and Charles Edgar Masterman, of London, England. The English patents having been granted, American patents were applied for and the fundamental letters patent protecting this invention is No. 907,847, granted on December 29, 1908. This patent with the other American rights was assigned to Alexander Dow.

The construction of the wheel is shown in Figs. 1 and 4, being plan and side elevation of the Dual design. As Fig. 1 shows the wheels are mounted on the ends of a lever L which is pivoted at its center on the end of the axle A. Referring to Fig. 4, it is seen that the two wheels are not the same distance from the longitudinal center line of the chassis, but that the front wheel is further from this line than the back wheel, the distance between adjacent plans of the wheels being the same as in the case of dual wheels mounted, in the ordinary way, on one axle. The drive is taken from the jackshaft J, which carries the differential to both wheels by separate chains and sprockets, both running at exactly the same speed, they being of the same diameter. The brake construction is as follows:

The brake drum B is fitted only on the rear wheels of the

Solid Tires for Commercial Vehicles

(Continued from page 485.)

coated fabric, and the beads of the tire are clamped in position on the steel S. A. E. felloe band by outside flanges and a series of through bolts. The block tire, which has just been placed on the market, is of the individual block type. The method of attachment differs from any other tire of this description on the market. The blocks are laid on the permanent rim and retainers in the shape of an offset figure 8 are placed over the blocks and bolts pass through the center of the retainer and the wooden felloe to secure the blocks. In addition the sides of the retainers are clamped by outside flanges. The blocks are staggered or in other words are placed alternately with the block on one side, filling the corresponding gap between two blocks on the other side.

The United States Tire Company, New York, are offering two new types of tires for motor trucks, namely the demountable and the standard block tire. The demountable tire was placed on the market last year, but the block tire is new. The demountable type tire has a steel and hard-rubber base. The inside of the metal base is beveled on both sides to fit wedge-shaped flange rings used in connection with the rim. A section of the tire is shown in Fig. 7, from which it can be seen that the standard

S. A. E. rim is employed without interliners. The wooden felloe is drilled to receive the bolts that hold the side flanges in place. The flanges D and F differ in shape to most others of this class in that the wedge surface on the top continues the entire width. The spacer E is split, the same applying to the outside flanges. This permits of an increase in tension from time to time, if such is needed, and obviates the possibility of the rings freezing to the rim. To accommodate the split flange rings, the holes in them are slotted to give the rings the necessary expansion.

The United States block tire is an individual block tire in every sense of the word. Each and every block can be removed and replaced separately and the tire will fit a standard S. A. E. rim without alteration or drilling of additional holes. The sectional view in Fig. 7 shows the method by which the blocks are held in position. Each block has a steel base with chamfered sides. The sides fit under the center ring A and are held on the outside by the undercut flanges B and C. The side view of the tire, Fig. 7, shows how each block has its individual flange piece, held in position by two nuts and lock washers. Upon removal of the rim section the block can be taken out without disturbing the remainder of the tire.

system and is the emergency brake of the truck, but through the chain brakes all four wheels. The drum is intended to be operated by lever through connections, being such that when the chain between the two wheels of the system is being adjusted, it is not necessary to change the brake adjustment; the latter is not interfered with by either the front or rear wheel of the system riding over elevations or dropping into depressions. This is accomplished as follows: The brake connection rod B₁ parallels the radius rod R and couples with a bellcrank K at a point T which is in alignment with the center of the hub of the front wheel of the system. The bellcrank K works on T as a center and has a connecting arm K which is hooked at its rear end. The chains between the front and rear wheels of the system are adjusted by the rear stub axle having the portion carrying the wheel eccentric to the portion in the housing. This dual system can be fitted on any standard chain-driven truck, such equipment calling for the elimination of the old axle but permitting the use of the original springs.

The springs rest on the axle A which acts purely as a weight-carrying member. Through this axle and the horizontal levers the weight is so distributed as to be carried equally by all four wheels, and the axle is so mounted that exactly twice as much weight rests on it than does on the front axle of the truck. The dual equipment itself adds about 400 pounds to a 5-ton truck. The centers of the front wheelhubs of the dual wheel equipment occupy the same position as the rear axle, before the dual construction is installed. By this arrangement the dead axle A is placed farther back, the wheelbase being consequently lengthened by 12.5 inches. The tread, on the other hand, is not increased; but, in the case of a 5-ton Mack truck, has been reduced to 70 inches, the standard tread for commercial vehicles of this type being 71 inches.

As each of the four rear wheels carries the same weight, the weight of each individual wheel is reduced 50 per cent., the tire surface being the same as in the case of single wheels. This results, of course, in a saving of tires. As the tires contact at four points with the roadbed, side-skidding is made practically impossible; while the use of four tractive wheels in itself insures good traction under almost all conditions. Incidentally, the brake efficiency is increased—according to the claims of the maker—due to the use of four road wheels. Another advantage claimed is the saving in fuel in climbing out of a hole or over a road obstacle, as it is easier to get traction with two out of four wheels than with two wheels on'y; spinning of the wheels is therefore made practically impossible, since the connection of the wheels through the medium of the jackshaft keeps any individual wheel from speeding up. The vibration of the

entire truck mechanism and the effect of road shocks is indeed remarkably small, as was witnessed by a representative of THE AUTOMOBILE during a test. The above-mentioned 5-ton Mack truck was run against a curbstone, mounting it with an almost unnoticeable shock, while holes and bumps in the road were taken with the greatest ease and producing very little vibration. This latter point is perhaps one of the most important advantages of the Dow Dual scheme, as it necessarily tends to reduce depreciation and thus results in a direct saving of money.

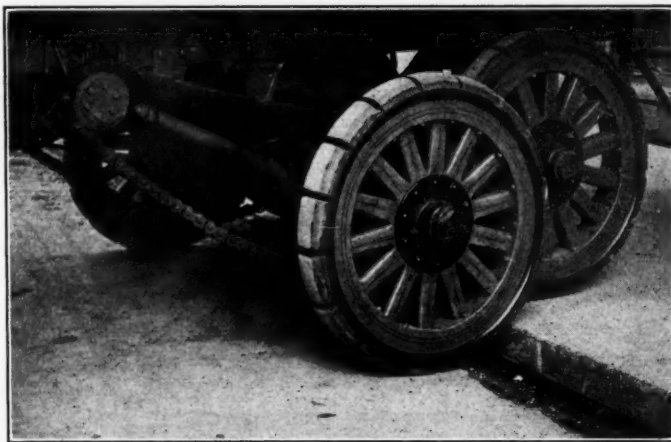


Fig. 2—Dow dual wheels and chain drive

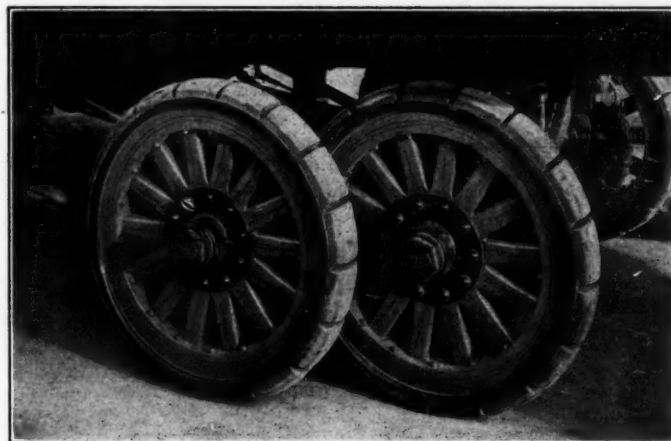


Fig. 3—Dow wheels have minimum clearance

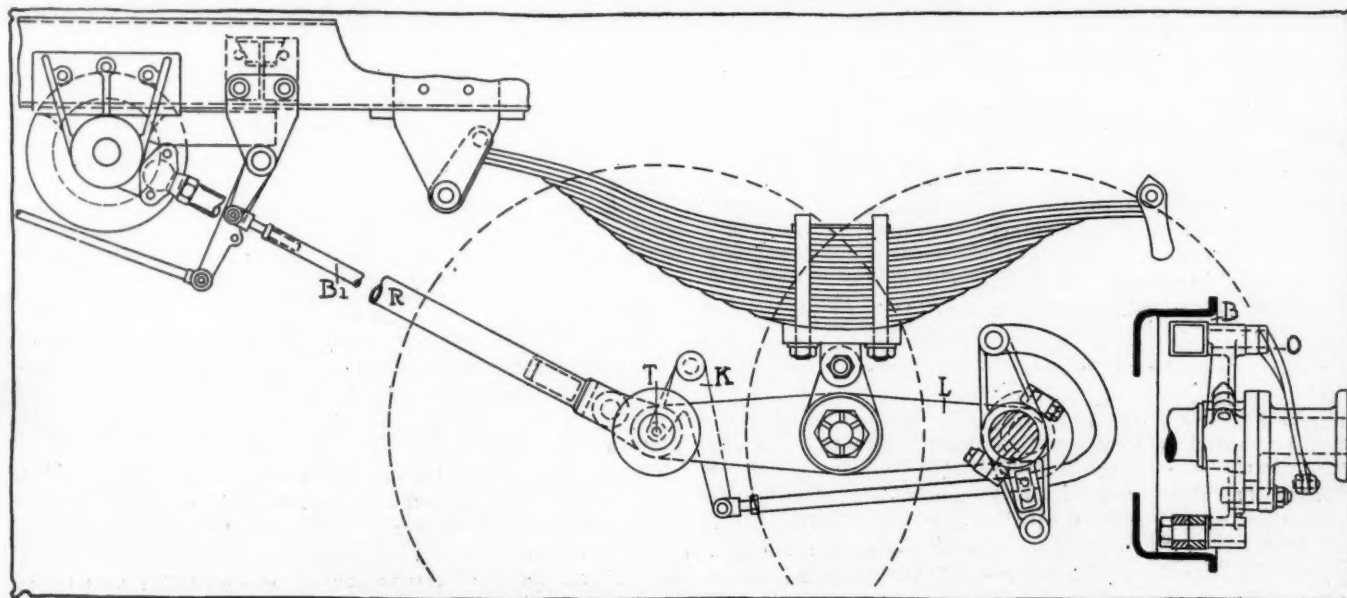
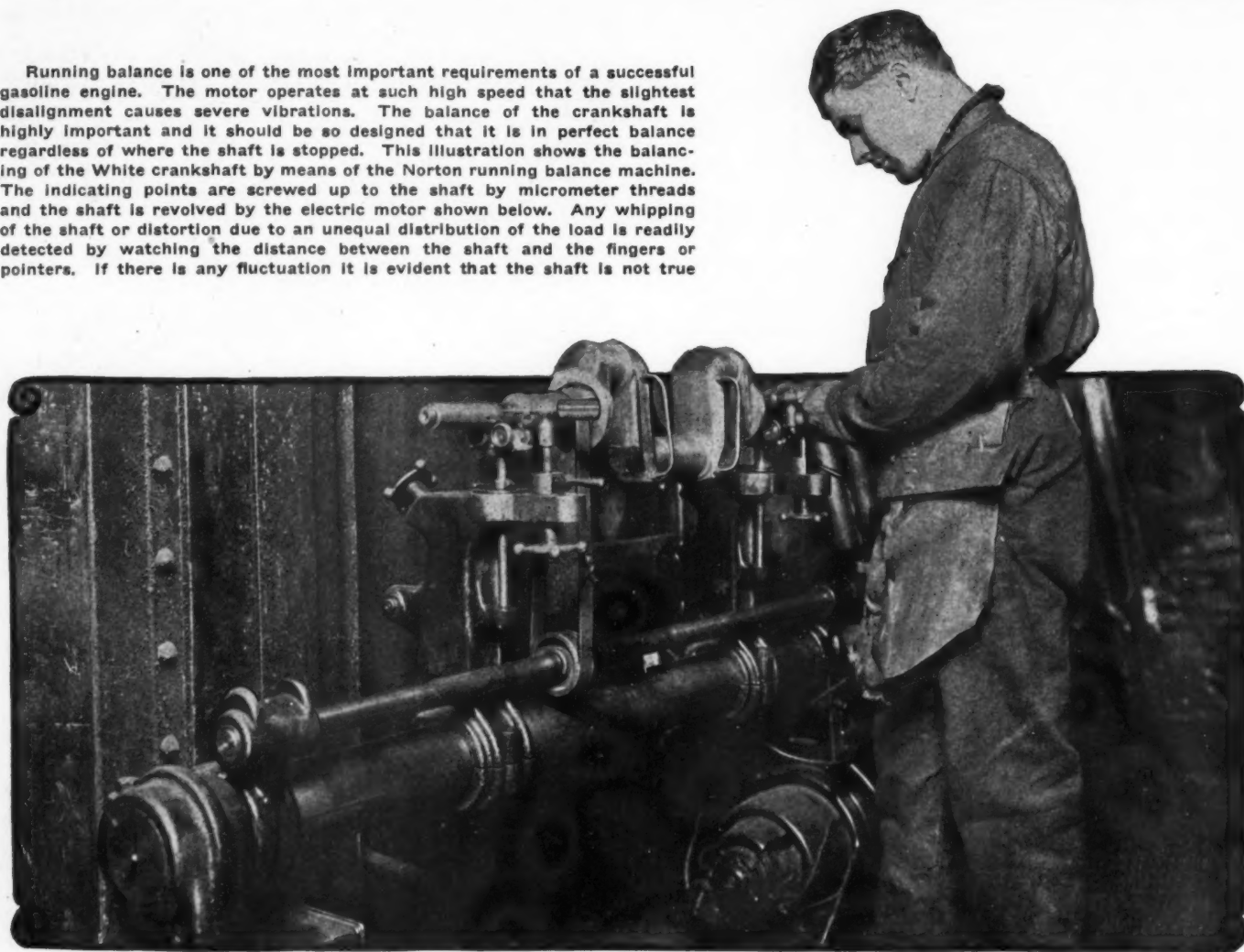


Fig. 4—Elevation of Dow dual wheel rear unit, showing brake adjustment mechanism

Factory Miscellany

Running balance is one of the most important requirements of a successful gasoline engine. The motor operates at such high speed that the slightest disalignment causes severe vibrations. The balance of the crankshaft is highly important and it should be so designed that it is in perfect balance regardless of where the shaft is stopped. This illustration shows the balancing of the White crankshaft by means of the Norton running balance machine. The indicating points are screwed up to the shaft by micrometer threads and the shaft is revolved by the electric motor shown below. Any whipping of the shaft or distortion due to an unequal distribution of the load is readily detected by watching the distance between the shaft and the fingers or pointers. If there is any fluctuation it is evident that the shaft is not true



Balancing the White crankshafts in the testing department of the company's factory at Cleveland

SANFORD Truck to Build—The Sanford Motor Truck Company has purchased from the Syracuse, N. Y., Savings Bank a brick building and will occupy it for factory purposes. Alterations and improvements are being made in the plant which has a floor space of upward of 60,000 square feet. New machinery, including a large freight elevator, is being installed. The plans call for a plant with a manufacturing capacity of 1,000 motor trucks a year.

Lee & Porter Add—The Lee & Porter Manufacturing Company, Buchanan, Mich., will erect a frame addition to its plant for making automobile axles. The new structure will be 32 feet by 90 feet with concrete foundation.

Factory for Centralia—W. A. Perkins, Seattle, Wash., is interested in the organization of a company with a capital of \$2,000,000, which will construct an automobile factory in Centralia, Wash. The proposed structure will cost about \$250,000.

Work on New Pilot Factory—Construction work has started on the new addition to the plant of the Pilot Motor Car Company, Richmond, Ind. The new building, which will be two stories high and 120 feet long, will be finished in 40 days.

Bidding on Ford Plant—Bids are being received for the

structure of a five-story factory, 150 feet by 150 feet in size, for St. Louis, Mo., for the Ford Motor Car Company, Detroit, Mich. It will be of reinforced concrete and will cost approximately \$150,000.

Enlarge Chalmers Plant—The Chalmers Motor Car Company, Detroit, Mich., is reported to have made plans for the erection of a new building, with 24,000 square feet floor space, to be used for general manufacturing purposes. This will give the Chalmers a combined floor space of over 1,000,000 square feet.

More Freight Cars Needed—The traffic manager of the Ford Motor Company, Detroit, Mich., estimates that more than 30,000 cars will be needed to care for the factory's shipping during the coming year. To take care of this large amount of business five additional side tracks are being built at the factory.

New Departure's New Plant—Increased business will necessitate the immediate operation by the New Departure Manufacturing Company, Bristol, Conn., of the plant of the Whitlock Coil Pipe Company at Elmwood, Conn., recently acquired. The home plant of the company at Bristol is working to capacity. The Whitlock plant was taken on to meet the need for additional factory space.



Shows, Conventions, Etc.

- Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.
- Feb. 8-15.....Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.
- Feb. 8-15.....Minneapolis, Minn., Annual Automobile Show.
- Feb. 10-15.....Chicago, Ill., Truck Show.
- Feb. 10-15.....Winnipeg, Man., Show, A. C. Emmett.
- Feb. 10-15.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.
- Feb. 11-15.....Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.
- Feb. 15-22.....Albany, N. Y., Annual Show, State Armory, Dealers' Association.
- Feb. 15-22.....Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.
- Feb. 16-23.....Richmond, Va., Annual Show.
- Feb. 17-22.....Kansas City, Kan., Annual Automobile Show.
- Feb. 18-19.....Madison, Wis., Annual Show, City Market Building, Dealers' Association.
- Feb. 18-21.....Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.
- Feb. 18-22.....Baltimore, Md., Annual Show, B. A. D. A.
- Feb. 19-22.....Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.
- Feb. 19-22.....Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.
- Feb. 19-22.....Kalamazoo, Mich., Annual Show.
- Feb. 19-23.....New Orleans, La., Annual Show.
- Feb. 19-27.....Topeka, Kan., Annual Show.
- Feb. 20-22.....Canandaigua, N. Y., Automobile Show, Louis Blumenstein.
- Feb. 22-Mar. 1....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.
- Feb. 24-27.....Kansas City, Mo., Truck Show.
- Feb. 24-Mar. 1....St. Louis, Mo., Annual Show.
- Feb. 24-Mar. 1....Memphis, Tenn., Annual Show.
- Feb. 24-Mar. 1....Omaha, Neb., Annual Automobile Show.
- Feb. 24-Mar. 1....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.
- Feb. 24-Mar. 5....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.
- Feb. 25-28.....Eau Claire, Wis., Annual Show, Armory, Dealers' Association.
- Feb. 25-Mar. 1....Syracuse, N. Y., Annual Show, Syracuse A. D. A.
- Feb. 26-Mar. 1....Fort Dodge, Ia., Annual Show.
- Feb. 26-Mar. 1....Glens Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.
- Feb. 27-Mar. 1....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.
- March 3-8.....Bridgeport, Conn., Show, Park City Rink, B. B. Steiber.
- March 3-8.....Denver, Col., Annual Show, Municipal Auditorium.
- March 3-8.....Springfield, Mass., Automobile Show, New Auditorium Building, United Amusement Company.
- March 3-18.....Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.
- March 5-8.....Tiffin, O., Annual Show, Tiffin Daily Advertiser.
- March 5-8.....Louisville, Ky., Annual Show, Dealers' Association.
- Mar. 5-8.....London, Ont., Annual Show, Drill Hall, Louis Blumenstein.
- March 8-15.....Boston, Mass., Annual Automobile Show.
- Mar. 8-15.....Columbus, O., Annual Show, Billy Sunday Tabernacle, Automobile Club and Trades' Association.
- March 12-15.....Ogdensburg, N. Y., Automobile Show, Louis Blumenstein, Manager.
- March 19-26.....Boston, Mass., Annual Truck Show.
- March 20-24.....New Orleans, La., Annual Show, N. O. A. D. A.
- March 24-29.....Indianapolis, Ind., Annual Automobile Show.
- March.....Nashville, Tenn., Annual Show, Nashville Automobile Dealers' Association.
- March.....Pittsburgh, Pa., Annual Automobile Show.

Race Meets, Runs, Hill Climbs, Etc.

- May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.
- July 27-28.....Tacoma, Wash., Tacoma Road Races.
- Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
- Nov. 26.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

Foreign

- March.....France, Sealed Bonnet, 3000-Mile Run.
- March 31.....Montevideo, Uruguay, International Competition of Agricultural Motor Vehicles.
- April.....Barcelona, Spain, International Exhibition.
- May.....St. Petersburg, Russia, International Automobile Exposition, building of Michael Maneze, Imperial Automobile Club of Russia.

Wright Leaves Springfield Body.—J. A. Wright, body designer and general foreman of the Springfield Metal Body Company, Springfield, Mass., has gone to New Haven, Conn. He is now with the New Haven Carriage Company.

Morrow's One-Story Addition.—The Morrow Manufacturing Company, Elmira, N. Y., manufacturer of automobile parts and accessories, has plans in progress for a one-story addition to its plant, which will add about 50,000 square feet of floor space.

Michigan Builds New Office.—The Michigan Motor Car Company, Kalamazoo, Mich., is preparing to erect a new office building on a vacant tract adjoining its factory. The new structure will be equipped in the most up-to-date manner and will represent an outlay of \$250,000.

Appraisers Examine Knox Factory.—The entire assets, real and personal, of the Knox Automobile Company, Springfield, Mass., are now being appraised by the American Appraisal Company. No definite action on the proposition to reorganize the company will be taken until a full inventory of the plant is taken.

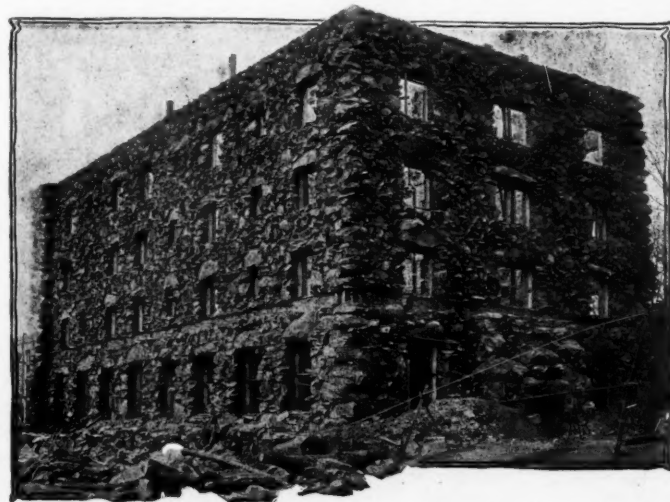
Ford Assembling in Hutchinson.—Arrangements have been made with a Hutchinson, Kan., automobile concern by the Ford Motor Car Company, Detroit, Mich., to utilize part of the establishment for the assembling of Ford cars for the central and western parts of Kansas. The work is expected to give employment to about thirty men.

Steel Wheel Company Builds.—The Steel Wheel Company, Bethlehem, Pa., which will manufacture a spring steel wheel for use on automobiles and motor trucks, will shortly locate a factory on Broad street in that city. It will be of three stories with ample floor space for the assembling of machines and the manufacture of wheels.

Gould to Superintend Alco Manufacture.—J. W. Du B. Gould, of 30 Church street, New York City, has made arrangements to connect with the American Locomotive Company, Providence, R. I., in the capacity of an efficiency engineer. He will superintend the manufacture of automobiles with a view to obtain greater factory efficiency.

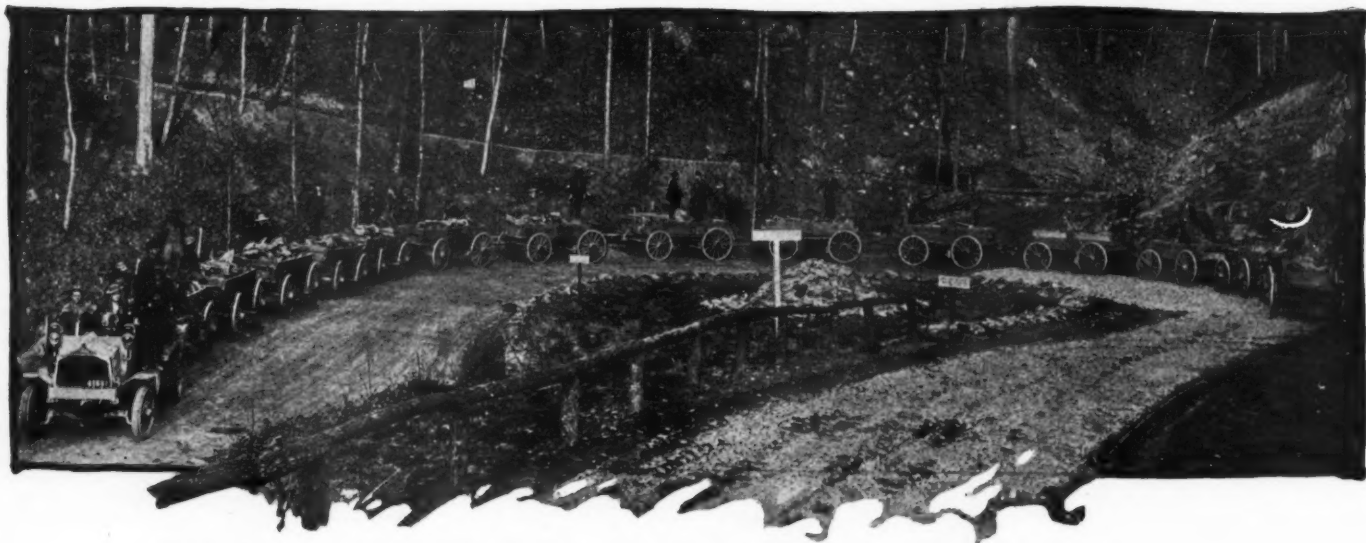
Davis-Bach's New Plant.—The Davis-Bach Manufacturing Company has established itself in a model plant at Alliance, O. Incorporated under the laws of Ohio, the new industry will specialize in the manufacture of automobile parts and steel stampings, and also its own line of radiators, airless tires, horns, etc. C. H. Davis is president, and J. J. Schmidt, vice-president.

Budd Buys Grabowsky Plant.—Negotiations have been completed by which the Edward G. Budd Manufacturing Company, Philadelphia, Pa., purchases the plant formerly occupied by the Grabowsky Power Wagon Company, Detroit, Mich. Extensions will be begun immediately to cost about \$200,000. The property purchased contains a modern reinforced concrete factory building, four stories in height, containing 72,000 square feet of floor area and a modern power building. It is planned to begin at once the erection of a factory building that will contain about 135,000 square feet. Between 300 and 500 men will be employed, and it is expected the plant will have an output of at least 30 completed bodies a day by next May. The company manufactures pressed steel bodies for commercial and pleasure cars, the parts being welded to form one piece, practically without joints or seams.



East wing Grove Park Inn made from crude mountain road rock

BULLETIN News of the Week Condensed



Packard truck of 3 tons capacity drawing a wagon train of fifteen wagons up a North Carolina mountain

MIDSUMMER Show for Detroit—Harry Fosdick, director of sales for the Hupp Motor Car Company, Detroit, Mich., states that there is only one drawback in regard to automobile shows, and that is the time of holding the events. He thinks that the most opportune time is in midsummer, just after the different manufacturers announce their new models, and he with a number of manufacturers made a proposal during the recent New York show to the effect that it would be for the advantage of all concerned to stage the next national show at Detroit at that time of the year.

Havers Makes Hard Trip—J. R. Elliott, of Portland, Ore., recently drove a Havers car from that city to Medford, a distance of 300 miles, over the roughest roads of that state.

Wheeler with Johns-Manville—The H. W. Johns-Manville Company, New York City, has appointed C. L. Wheeler as traveling representative in its Atlanta, Ga., territory.

Handles J. M. Shock Absorber—The Powell-Elliott Auto Repair Company, Brooklyn, N. Y., has acquired the general agency for that city and Long Island for the J. M. shock absorber.

Manitoba Spends \$1,000,000—A report issued by the Highways Commissioner for the Province of Manitoba shows that a sum over \$1,000,000 was spent during 1913 on the highways of the province.

Taffinder Retires—S. N. Taffinder, of Monterey, N. L., Mexico, has retired from the management of the Fronterizo Garage, for which he previously held power of attorney from Antonio Elosua and his wife.

Automobile Conference—The Automobile Underwriters' Conference met recently and elected officers for the ensuing year as follows: C. F. Jungman, president; W. F. Whittlesy, vice-president, and D. F. Cox, secretary.

Fisk Factory Branch in Winnipeg—The Fisk Rubber Company of New York City has opened a direct factory branch in Winnipeg, Man. The branch is one of the first in Canada to be operated directly by the factory which manufactures the tires.

Service Department Established—Joseph Maw & Company, Ltd., Winnipeg, Man., has established a service department in its agency with Frederick Sager manager. One of the principal functions of the department is the instruction and education to the owners in the proper care of their cars.

Mitchells for Moving Pictures—Both the Kinemacolor and the Universal Film companies, with three others—the Ma-

jestic, Carlton and Vitagraph—are using Mitchells in their moving pictures and also for the transportation of the actors and paraphernalia to and from the scene of the plays.

Car Ordered by Wireless—What is probably the first order ever taken via wireless by an automobile salesman was recorded recently by G. N. Jordan, Los Angeles, Cal., branch manager for the R-C-H car. The order came from C. E. Hansen, who was aboard the steamer Mauretania returning from Europe.

Korea's Seventh Car Hudson—Korea recently bought its seventh car, a Hudson. All of the cars are American makes and their importation has extended over a period of 4 years. The fewness of automobiles in that country is probably due to the fact that it is a very mountainous region and has very few good roads.

Corbin Speedometer on Keeton—Colonel Wilbur C. Brown, general sales manager of the Corbin-Brown speedometer division of the American Hardware Corporation, New Britain, Conn., has arranged to outfit the Keeton car entered in the Indianapolis, Ind., 500-mile race with a 200-mile speedometer, something never before made.

Inter-Provincial Highway Movement—The movement for the construction of an inter-provincial highway between Montreal and Toronto and Montreal and Ottawa is meeting with success. This highway entails the construction of bridges connecting Montreal with the mainland from a point at St. Anne de Bellevue to Ile Perrot and another bridge from Ile Perrot to a point in Vaudeuil County.

Amend Automobile Bill—The Dunn automobile license bill, up for hearing recently before the House Tax Committee in St. Paul, Minn., probably will be amended to eliminate a license based upon the horsepower of automobiles and to fix a flat registration fee for each machine of about \$10. It is probable that the money collected from automobile registration will be distributed among the counties for road purposes, instead of being handled directly by the State highway commission, as the bill provides.

Texas Motor Speedway Formed—J. D. Christenson, of St. Louis, Mo., is named as the principal stockholder in the Texas Motorway Company, which has just been organized for the purpose of constructing an automobile highway between Dallas and Del Rio, Tex., a distance of approximately 500 miles. The company has a nominal capital stock of \$10,000, divided into 100 shares of \$100 each. Mr. Christenson owns sixty-four of the shares, G. W. Baker, of Dallas, thirty-five, and G. L. Cade, of Dallas, one.

New Agencies Established During the Week

PLEASURE CARS

Place	Car	Agent
Atlantic City, N. J.	Moon	Harry T. Erpenback
Baltimore, Md.	Pathfinder	L. M. Vordemberge Motor Co.
Baltimore, Md.	Stoddard-Dayton	A. Trust Poehlmann
Brooklyn, N. Y.	Moon	Dunham Auto Co.
Charlotte, N. C.	Franklin	Woodside Motor Co.
Deer Lodge, Mont.	R-C-H	G. Van Arsdale
Des Moines, Iowa	Moon	Central Iowa Motors Co.
Durango, Colo.	R-C-H	D. R. McKinney
Evant, Tex.	R-C-H	C. W. Workman
LaFayette, Ind.	R-C-H	Geo. B. Doyle
Lake City, Minn.	R-C-H	Zwick Bros.
Littleton, N. H.	R-C-H	Gadbois & Greenwood.
Milford, Ind.	R-C-H	R. W. Method
Minneapolis, Minn.	King	Barclay Automobile Co.
Montclair, N. J.	Moon	Montclair Garage & Machine Co.
Montreal, Que.	Hupp-Yeats	C. W. Doheny
Montreal, Que.	Locomobile	Provincial Motors, Ltd.
Montreal, Que.	Ohio	C. W. Doheny
Passaic, N. J.	Moon	Sheely Motor Car Co.
Presho, S. Dak.	Moon	Reetz & Brown
Red Bank, N. J.	Moon	Fred H. Van Dorn
Redlands, Cal.	R-C-H	Jas. H. Maize, Jr.

Place	Car	Agent
Redwood City, Cal.	R-C-H	Miller Paulsen
Rochester, N. Y.	Franklin	MacCollum and Stevens
Saginaw, Mich.	R-C-H	Oliver B. Whipple
San Diego, Cal.	R-C-H	C. deBlinn
San Diego, Cal.	R-C-H	E. C. Bigelow
Sioux Falls, S. Dak.	Moon	Hessius Auto Co.
Tabor, S. Dak.	Moon	Tabor Mercantile Co.
Union Hill, N. J.	Moon	Clifton Auto Co.
Victor, Colo.	R-C-H	Bert Snyder
Waltham, Mass.	R-C-H	Ernest R. King
Washington, D. C.	Moon	Moon Motor Car Co.

COMMERCIAL VEHICLES

Baltimore, Md.	Commerce	Square Deal Auto Co.
Boston, Mass.	Westcott	Westcott Motor Company
Buffalo, N. Y.	Westcott	Mutual Motor Car Co.
Pittsburg, Pa.	Westcott	Westcott Motor Sales Co.
Washington, D. C.	Commerce	Loffler Co.

ELECTRIC VEHICLES

Montreal, Que.	Buffalo	Universal Electric Company.
----------------	---------	-----------------------------

Seymour with White—Joseph Seymour has joined the selling force of the White company in New York City.

Bill with Disco Starter—H. L. Bill, of Detroit, Mich., has become manufacturing expert for the Disco Starter Company, of that city.

Bates with Firestone—G. J. Bates has recently connected with the Firestone Tire & Rubber Company, Akron, O., having charge of the sales in the pneumatic tire department.

Automobile Trade in Mexico—Three passenger automobiles and two motor trucks, all of American make, have been imported into northeast Sonora, Mexico, within the past 2 months.

New Georgia Road—It has been decided to begin immediately the construction of a temporary highway through the great Altamaha swamp, which will, as rapidly as possible, be made a part of the Savannah, Ga.,-Jessup highway.

Lexington Club Elects—The New Lexington Automobile Club, New Lexington, O., has elected the following officers for the year: C. C. Chapplear, president; H. A. Lowe, vice-president; C. L. Chuet, secretary, and J. O. Cullen, treasurer.

Philadelphia Tire Firms Combine—The M-S-H Sales & Rubber Company and Meeley Tire House, Philadelphia, Pa., have been consolidated and will hereafter be known as the Meeley Rubber Company, Inc., with headquarters at 660 North Broad street.

Inspector to Enforce Laws—The Ohio State Automobile Department, located in Columbus, O., will soon start out a traveling inspector to make the rounds of Ohio cities with a view of enforcing the State automobile law with reference to securing 1913 number plates.

Supply House in Bankruptcy—Millie Wachman, operating under the name of the U. S. Auto Supply & Manufacturing Company, Detroit, Mich., has filed a petition in bankruptcy in the United States Court. The assets are given at \$9,100 and the liabilities at \$10,731.45.

Jifty Directors Re-Elected—At the annual meeting of stockholders of the Jifty Auto Curtain Company, held in Chicago, Ill., recently, the entire board of directors holding office this past year were re-elected and the reports of business for the past year were presented.

Auburn's Fire Apparatus—Auburn, N. Y., will have after February 15, when work will be completed, a completed equipped automobile fire apparatus. The station cost \$15,000 and is used by Automobile Fire Company No. 3, which has been especially drilled for the new service.

Automobile Trade Association—Owners of garages and automobile repair establishments of Beaumont, Tex., recently formed the Beaumont Automobile Trades Association with all the seven proprietors in the city as members. J. G. Minter is president; C. A. Ross, vice-president and H. P. Jirou, secretary.

Milwaukee's Fire Equipment—Milwaukee, Wis., recently installed a motor-propelled fire-fighting equipment, a combination hose, chemical and flying squadron car built by the Stegeman Motor Car Company, of that city, at a price of \$5,500 with full equipment. The accompanying illustration shows the truck.

Savannah Dealers Form Organization—Savannah, Ga., automobile dealers have formed a temporary organization

and set a time and place for a more formal meeting at which a permanent organization will be perfected. J. E. Finney, agent for the Buick people, was made temporary chairman. The purpose of the organization is to encourage better business methods by co-operation.

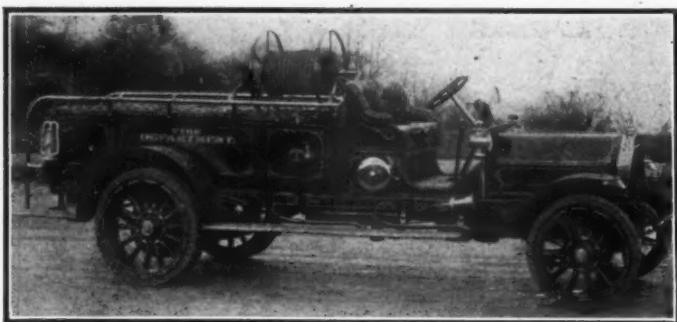
Manchurian Passenger Service—An automobile passenger service has been inaugurated between Tsitsihar and Blagovestchensk by the Eikhenbaum Company, Pristan, Harbin, Manchuria, China. Two closed and one open automobiles are to be used and the fare for a single trip in either direction is in the former 100 rubles, \$51.50, and the latter 75 rubles, \$38.63; 36 pounds of baggage will be allowed.

Ohio Treasury Enriched—The Ohio State treasury was enriched \$153,034.17 when a certified check for that amount was turned over to Treasurer Brenneman by J. A. Shearer, Ohio register of automobiles. The amount represented the receipts of the department for the month of January less the expenses of the department. The total receipts were \$169,319.65 and the expenses \$16,327.52. The gain over the same month last year was \$59,068.40.

Drivers' Club Formed—The Auto Drivers' Protective Association of Minneapolis, Minn., has been formed and has quarters at 735 Temple Court. The officers are: President, B. C. Montgomery; vice-president, W. H. Feitzler, and secretary-treasurer, B. M. Emerson. Mr. Geitzler will be manager. The purpose is to put driving on a good basis, to get legislation to control speed and to protect the right of its members, provide attorneys in case of arrest and hospital care in case of accident.



"Little Chunk of Cole" at the Chicago Colé Exhibit—He just smiles



New Stegeman flying squadron car of Milwaukee Fire Department

Jones Manager of Cole—H. S. Jones has been appointed manager of the Cole Motor Company, Philadelphia, Pa.

Will Attend Washington Convention—A delegation of merchants and farmers from Louisiana will attend the good roads convention in Washington, D. C., in March.

Bradford Now Manager—B. C. Bradford of Detroit, Mich., has taken the position of manager of the United Motor, Columbus, O., Company, succeeding F. E. McClure.

Organize Wabash Automobile Club—Wabash, Ind., automobilists held a meeting recently and organized an automobile club. C. H. LaSalle was named chairman and William Dixon, secretary.

Cortland Automobile Club's Banquet—The annual banquet of the Cortland Automobile Club was held at the Messinger Hotel, Cortland, N. Y., recently, and 230 members, with many friends, were present.

Wage Earners Number 75,721—The number of wage earners in the automobile industry in the United States is 75,721, and the automobile wage standard is said to be estimated somewhat higher than that of other industries.

Fort Atkinson Club Elects—The annual election of the Fort Atkinson, Wis., Automobile Association resulted as follows: President, Gavin Coppins; vice-president, R. F. Colby; secretary, C. A. Downing, and treasurer, G. E. Ward.

Peerless Sales Company Formed—The Peerless Sales Company, Ltd., Winnipeg, Man., was recently formed to sell the Peerless filler. This new concern is backed by prominent Winnipeg men and has for its managing director G. E. Webb.

Fire in Chicago Salesrooms—Fire destroyed \$30,000 worth of goods in the building at the Gardner Engine Company's Chicago, Ill., building. The Hester Manufacturing Company and the Motor Car Supply Company also occupy this building.

Peerless Moves in Columbus—The Columbus, O., branch of the Peerless car, of which F. J. Girard is manager, has moved its salesroom and service department to 168 North Fourth street. The new salesroom and repair shop is 168 feet by 35 feet.

Meyers Studebaker Manager—Henry Meyers has taken charge of the wholesale distribution of Studebaker cars and trucks for New England in the place of Philip Hawley, who resigned a few weeks ago, making Boston, Mass., his headquarters.

Amends By-Laws—The St. Louis, Mo., Automobile Manufacturers' and Dealers' Association has amended its by-laws to prevent exhibitors at the spring show held in the Coliseum each year, exhibiting at the show given by the association in the fall of each year.

New Tire Filler—A patent has been granted on a tire filler to A. J. Causey, sheriff of Amite County, Miss. A company has been formed to exploit the invention. The concern has applied for a charter under the name of Causey No-Leak Manufacturing Company.

Wants Automobiles—The purchase of automobiles for the use of the automobile bureau of the secretary of state in Albany, N. Y., and Buffalo will be recommended to the Legislature by Secretary May. The cars are needed to try out applicants for chauffeurs' licenses.

Goodyear Sales Large—At a banquet held recently by the Goodyear Tire & Rubber Company, Akron, O., in Chicago, Ill., F. A. Seiberling, president of the company, announced that the Goodyear sales for the year 1912 approximated \$25,000,000, nearly doubling the sales of 1911.

Miller Sells His Interests—A. R. Miller of Barthel, Daly & Miller, New York City, importers of Schafer ball bearings, has sold his interest to the remaining partners. Mr. Miller

will still continue as western representative for the firm, which will be known in the future as Barthel & Daly.

Baltimore Club Meets—The regular monthly meeting of the Automobile Club of Maryland, Baltimore, Md., was held at its clubrooms recently and the evening was spent in the discussion of the advisability of ordinances regarding the emission of smoke and the elimination of powerful lights from automobiles in the city.

Farmers' Day Show Feature—One of the features of the annual automobile show to be given at the Billy Sunday Tabernacle, Columbus, O., on March 8, will be farmers' day, which has been fixed for March 14. It is the intention to make this day one for the rural population of the state and a special program will be arranged.

Big Los Angeles Sale—The sale of half interest in the Pacific Coast Simplex and Mercer Agency by George Bentel of Los Angeles, Cal., to George Mackey of the same city, has just been announced. The deal is one of the largest and most important of the season as the territory controlled extends into Canada and south to Mexico.

Chance for American Agency—An American consular officer has forwarded a copy of a letter from a foreign government which desires to substitute automobiles generally for horses and carts for carrying rural mails. His company also desires to deal in automobiles, availing itself of the mail service as an advertising medium. As gasoline is an expensive item in that country, the firm wants a make which would be economical in that respect. If it can obtain cars run on kerosene, which can be depended upon, this will be a controlling factor in making selections. Those interested will get all information at the Bureau of Manufactures, Washington, D. C., file No. 10,359.

Automobile Incorporations

AUTOMOBILES AND PARTS

ALEXANDRIA, VA.—Express Spark Plug Company of America Incorporated; capital, \$10,000 to \$200,000. Incorporators: C. H. Duffey, John Keane, Leo Loughran.

ANDERSON, O.—Clark-Moody Automobile Company; capital, \$10,000; to deal in automobiles. Incorporators: John D. Clark, Louis W. Moody, Maud B. C. Clark, Anna M. Moody.

CINCINNATI, O.—Powel Crosley, Jr.; capital, \$30,000; to manufacture a six-cylinder car.

CLEVELAND, O.—Chandler Motor Car Company; capital, \$1,000. Incorporators: Isadore Grossman, Claude W. Shimmom, Harry C. Gahn, E. L. Fraser, S. D. Howells.

CLEVELAND, O.—Motor Van Delivery Company; capital, \$10,000; to carry on a general trucking business. Incorporators: Elizabeth Graham, S. T. Stewart, John R. Gaunter, Alice B. Gaunter, O. D. Eshelman.

COATESVILLE, PA.—Watts Wagon & Automobile Company; capital, \$5,000. Incorporators: F. N. Watts, Robert C. Birmingham, H. J. Faust, F. N. Pratt.

CONNERSVILLE, IND.—Howard Motor Car Company; capital, \$10,000; to manufacture automobiles and accessories. Incorporators: Guilford C. Babcock, Harry Tuttle, Clarence L. Millard.

DETROIT, MICH.—Detroit Trailer Company; capital, \$5,000; to manufacture automobile trailers and accessories. Incorporators: Stanley R. DuBrie, William H. Turner, A. C. Turner.

EL PASO, TEX.—Longwell Automobile Truck and Sales Company; capital, \$10,000; to deal in motor trucks. Incorporators: J. J. Longwell, H. M. Andreas, J. A. Tays.

FR. WAYNE, IND.—Fox-Shryock Auto Company; capital, \$10,000; to do an automobile sales business. Incorporators: William W. Shryock, Bartlett W. Shryock, George T. Fox.

GREENVILLE, O.—York Supply Company; capital, \$25,000; to deal in automobiles, supplies and accessories. Incorporators: C. F. York, C. H. York, A. Z. Heller, J. H. Byord, Lillie N. York.

KINGSTON, PA.—D. and H. Auto Company; capital, \$25,000; to buy, sell and deal in and with electric, steam and gasoline vehicles. Incorporators: John M. Deatrich, J. G. Harris, Lester Harris.

KNOXVILLE, PA.—Hollis Automobile Traction Company; capital, \$250,000; to manufacture, deal and sell in and with motor vehicles and all accessories thereto. Incorporators: O. A. Hollis, J. H. Mering, R. W. Egan.

MERCEDES, TEXAS.—Sterling Automobile Company; capital, \$10,000. Incorporators: A. H. Crawford, W. D. Chadwick, G. E. Simpson.

MOBILE, ALA.—Mobile Overland Company; capital, \$8,000; to deal in automobiles. Incorporators: Morgan L. Duke, Henry Tonsmeire, Norwood A. Richards.

NEW YORK, N. Y.—Accessories Sales Company; capital, \$50,000; to manufacture, sell and deal in and with automobiles and all accessories thereto. Incorporators: Charles Hymann, James R. Howe, Jr., Forrester A. Gin.

NEW YORK, N. Y.—Atlantic Transportation Company; capital, \$10,000; to engage in the trucking business. Incorporators: William T. Gridley, Albert B. Colton, Paul Englander.

NEW YORK, N. Y.—Chrome Manufacturing Company Incorporated; capital, \$25,000; to deal in motor and other vehicles. Incorporators: James E. Marshall, Wm. H. Buckley, William P. Green.

NEW YORK, N. Y.—Dann-Gorman Company Incorporated; capital, \$10,000; to deal in automobiles. Incorporators: Thos. F. Dann, John L. Gorman, John B. Gouger.

NEW YORK, N. Y.—Veerac Motor Truck Company Incorporated; capital, \$10,000. Incorporators: Harry B. McGinley, Edward L. Whittemore, Geo. H. Hinnau.

NORFOLK, VA.—Tidewater Automobile Association Incorporated; capital, \$500 to \$15,000. Incorporators: D. P. Paul, M. Levy, C. L. Young, J. K. Water.

Nadall with Stewart-Warner—Berne Nadall has joined the staff of the Stewart-Warner Speedometer Corporation, Chicago, Ill.

Bergougnan Tires in New York—The French Etablissement Bergougnan, which is preparing to invade the American market with its tires, has leased the premises at 49 West Sixty-fourth street, New York City.

Bryant Resigns from Franklin—G. H. Bryant has resigned as advertising manager of the Franklin Automobile Company, Syracuse, N. Y. He is succeeded by W. M. Williams, who has been assistant advertising manager.

Club After Noisy Automobilists—Noisy automobilists and motorcycles and irresponsible chauffeurs are being raked over the coals by the Savannah, Ga., Automobile Club. Automobiles with open mufflers are the greatest nuisances.

Hagerstown's Automobile Show—At a meeting of the 25 automobile agencies at Hagerstown, Md., arrangements were made to hold an automobile show. At least 100 cars will be on exhibit. The show probably will be held the first week in March.

Automobiles for Agricultural Work—The automobile is to be generally used in agricultural extension and development work in Minnesota. Seven automobiles are to be added this year to the extension equipment of the agricultural department of the University of Minnesota.

Ontario and Quebec Licenses—Mayor Ellis recently returned to Toronto, Ont., giving notice that he would at the next session of the Legislature move to amend the law relating to automobile traffic. This means that the Legislature will be asked to authorize the reciprocity of licenses between Ontario and Quebec.

Best in Savannah—Among the guests at the De Soto Hotel,

Savannah, Ga., is Vice-President W. F. Best of the Nyberg Automobile Company, Anderson, Ind., who is in the city on business connected with the automobile industry and also for the purpose of looking over the field with the idea of establishing a branch office there.

Western Electric Adds Officers—The Western Electric Company, which through its alliance with the Pittsfield Spark Coil Company, has chosen two new vice-presidents. Gerard Swope, general sales manager, and A. L. Salt, general purchasing agent, have been appointed to these newly created positions at a meeting of the board of directors.

Minneapolis Club Improves—Improvement work which the Automobile Club of Minneapolis, Minn., has decided on for 1913 is as follows: To improve the water front of the club property on the Minnesota River; raise the membership to 1,200 or more, and put up at least 100 additional road signs.

New Motor Bus Line—A corporation has been formed in Worcester, Mass., called the Worcester & Paxton Motor Company, to operate a motor express and passenger service between the two places. George H. Johnson, of Paxton, is president and treasurer; J. N. Peck, vice-president, and George C. Douglass, clerk.

North Dakota Registration Statistics—A report of the secretary of state of North Dakota, just issued, of automobile and motorcycle licenses for 1912 goes to show that Cass county leads in number and Oliver county has the minimum. Grand Forks county is second. In all there are 8,897 automobiles in the state and 469 motorcycles, with tax receipts of \$28,398.

Syracuse License Distributing Point—The Automobile Club of Syracuse, N. Y., through its president, H. W. Smith, asked Governor Sulzer's board of inquiry at Albany recently that when the new legislation is prepared Syracuse be made a distributing point for automobile licenses, it being argued that Rochester is too far away to require Syracuse automobilists to go there for them.

Wants Fire Department Motorized—Fire Chief C. W. Ringer of Minneapolis, Minn., is expecting favorable action on a \$150,000 bond issue so he can continue to motorize the department. Eleven pieces will be added if the bond issue is authorized for the purpose. He believes that with \$350,000 he could do away with the horse entirely, which would be a saving of \$50,000 a year, he estimates.

Two Los Angeles Agencies—Because of the greatly increased demands upon its services the branch of the Chalmers Motor Company at Los Angeles, Cal., will in the future be conducted in two separate establishments, one of which will handle the wholesale and the other the retail sales. The former will be under the Western Motor Company, while the latter will do business as the Chalmers-Los Angeles Company.

Work on Coast-to-Coast Road—The painted automobile trail from New York to the coast is being marked along the Southern Minnesota division of the Chicago, Milwaukee & St. Paul road. A crew is now marking the course with posts in the vicinity of Albert Lea, Minn. Posts are painted with broad stripes so the motorist can travel day or night. Where there are no standing telephone poles the crew is setting posts for markers.

Ontario's Registration Large—Ontario's revenue last year from the sale of licenses for automobiles totaled \$50,831.25, twice the amount received during the year 1910, which was \$24,394. The revenue for 1906, the first year fees were imposed, was only \$15,235.15. The licenses issued last year totaled 11,339, and for 1910, 4,390, while in 1906 1,176 were issued. Fees collected for issuing charters to automobile corporations totaled \$235,663.10.

Automobile Incorporations

PITTSBURGH, PA.—Pullman Taxi Service; capital, \$5,000; to conduct a taxicab business. Incorporators: W. M. Laird, W. S. Laird, W. M. Laird, Jr., E. F. Kramo, A. W. Tennant.

ROCHESTER, N. Y.—Alling & Miles Incorporated; capital, \$20,000; to do a general automobile business. Incorporators: Edmund M. Alling, Alice R. Alling, Milton B. Miles.

STAUNTON, VA.—Flynn-Allen Tire Corporation; capital, \$10,000; to manufacture tires. Incorporators: J. J. Flynn, G. Allen.

STRATHROY, ONT.—Loyal Motor Car Company, Ltd.; capital, \$500,000; to manufacture and deal in automobiles and accessories, machinery and vehicles of other kinds. Incorporators: D. W. Henry, J. M. McEvoy, H. E. Anderson, C. S. Parker, C. C. Wright.

TOLEDO, O.—General Motor Truck Company; capital, \$50,000; to manufacture motor trucks. Incorporators: C. B. Grandy, C. O. Norton, E. M. Dotson, W. C. Prickett.

WHEELING, W. VA.—Lavender Automobile Supply Company; capital, \$25,000; to operate and let for hire automobiles, operate garage and storage houses. Incorporators: A. E. Kennard, Jr., C. E. Lavender, R. M. Lavender, A. E. Kennard, Sr., Annie Kennard.

GARAGES AND ACCESSORIES

BROOKVILLE, O.—Brookville Automobile Company; capital, \$10,000; to operate a sales agency and operate a garage and repair automobiles and other motor vehicles. Incorporators: J. Ward Somers, Edward S. Somers, V. T. Somers, John K. Somers, Anna Somers.

CLEVELAND, O.—Motor Car Service Station Company; capital, \$100,000; to repair automobiles of all kinds and operate a storage business. Incorporators: Paul S. Knight, M. Marquard, Don C. Mills, M. W. Spear, W. P. Godfrey.

COLUMBUS, O.—Park Motors Company; capital, \$30,000; to conduct a garage and repair shop and devote considerable attention to the development of a starter which is being experimented upon. Incorporators: Scott Van Etten, Charles Parkison.

HAMILTON, O.—Hamilton Taxicab Company; capital, \$5,000; to engage in the transportation of passengers and baggage for hire. Incorporators: J. A. Weigel, Cora A. Weigel, George J. Kalbheir, Louise E. Weigel, Caroline Weigel.

HARROLD, S. D.—Allen-Schultz Company; capital, \$50,000; to manufacture an automobile tire filler.

HOPKINSVILLE, O.—Christian County Automobile Club; to carry on an automobile club. Incorporators: J. F. Bible, Frank Bassett, H. A. Keach.

NEW YORK, N. Y.—Aeroplanes Motors & Equipment Company Incorporated; capital, \$20,000; to manufacture and sell aeroplanes and equipment. Incorporators: Bernard Cowen, Max Miller, Maurice Lazone.

NEW YORK, N. Y.—Commercial Lubricating Company Incorporated; capital, \$2,500; to deal in oils, greases, etc. Incorporators: Agnes R. Mayfield, Louis Preau, John J. Crawford.

NEW YORK, N. Y.—Munnich's Garage Incorporated; capital, \$500. Incorporators: Christopher Munnich, Elizabeth Munnich, John Munnich.

NEW YORK, N. Y.—United Garage Company; capital, \$14,000. Incorporators: Knud Mynter, Edwin B. Smith, Samuel Ecker.

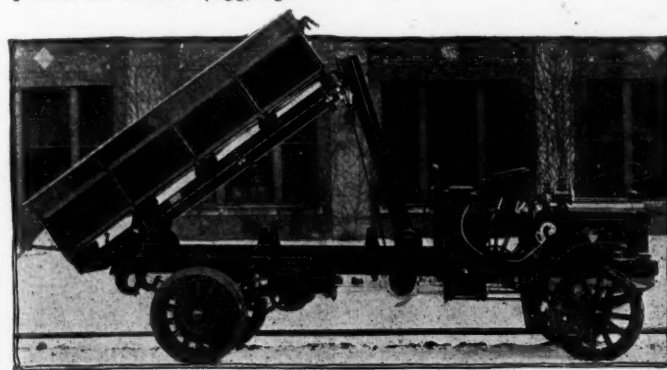
SPRINGFIELD, O.—Maitland Rubber Company; capital, \$10,000; to manufacture rubber and deal in rubber articles of all kinds, including tires and other automobile accessories. Incorporators: Frank R. Talbot, Cora P. Coitwell, Frank P. Patrick, Garnet W. Brand, Henry H. Durr.

WHEELING, W. VA.—Adolph Schick; capital, \$10,000; to manufacture a wheel for automobiles invented by Adolph Schick.

WILMINGTON, DEL.—Colonial Tire & Rubber Company; capital, \$25,000; to manufacture tires for automobiles. Incorporators: F. D. Buck, George W. Dillman, B. M. Grawl.

CHANGES OF CAPITAL AND NAME

SPRINGFIELD, O.—Robbins & Myers Company; increase of capital from \$50,000 to \$1,000,000.



New Packard dumping body, showing same in tilted position



Patents Gone to Issue

SPRING Wheel Construction—Resiliency is furnished by bow and spiral springs in place in a space formed between two concentric rims.

The subject matter of this patent is a wheel, Fig. 1, which consists of an inner rim I and an outer rim O spaced from one another. The opposed faces of rims I and O have pins projecting into the space formed between them and bow springs B, the ends of which are provided with openings engaging the pins are mounted intermediate the rims. Spiral springs S are in position on the pins. The inner portions of the springs B are so shaped as to fit the curvature of the inner rim I; these inner portions P are relatively longer than the outer portions Q of the springs B, and, as Fig. 1 shows, the intermediate portions of the bow springs lie diagonally between the rims I and O.

No. 1,051,745—to Ola C. Messick and Frank Jefferson, Seaford, Del. Granted January 28, 1913; filed April 25, 1912.

Headlights Cut-Off Shade—Consisting of hoods which may be moved in front of the headlight flame or bulb by a mechanism controlled from the driver's seat.

Fig. 2 illustrates the cut-off shades for automobile headlights described in this patent. This device consists of a number of lamp hoods H, one of which is carried by each lamp casing. The hoods of the two headlights are fitted with stub shafts, which are connected with hood-operating rods R; the latter are engaged by a coupler member C. A bell crank B carried by the front of the car is connected to the coupler member and to an operating link O adapted to pass along the side of the automobile so that by operating a suitable control mechanism from the driver's seat the shades may be positioned in front of the headlights or lifted from this position.

No. 1,051,388—to Maurice F. Castleman, Berryville, Va. Granted January 28, 1913; filed March 7, 1912.

Resilient Automobile Wheel—Consisting of three rings so arranged as to form the base for a solid annular tire.

This patent describes a wheel, Fig. 3, consisting of a fellow, a pair of endless rings R secured to its lateral faces and transversely aligned apertures in which cross bars C are

mounted. Treads forming members M have their lateral walls concentric with the flaring portions of the rings R and their ends overlapping with the lateral walls, in engagement with the inner faces of the outwardly flaring portions of the rings. The contacting portions of M and R form frictional joints J resisting inward pressure on M. The outer faces of M are formed with a continuous circumferential groove G, which constitutes a seat for an elastic tire T. Springs S hold the members M and the cross bars C together.

No. 1,051,457—to Bert Halaster Seevers, Akron, O. Granted January 28, 1913; filed August 2, 1912.

High-Tension Ignition—Including means for producing a high-frequency, oscillatory discharge at the spark plugs for igniting the cylinder charge.

The ignition system, Fig. 4, includes a current source S, a self-induction coil, a condenser C, a discharge circuit D for the same and a resonator R attached to the spark plugs for producing oscillatory high-frequency discharges at the same. When the circuit controlling the whole system is closed, the current flows from the battery S through the coil, which attracts an armature, charging the condenser. As the armature returns to its normal condition, closing the discharge circuit, a current is shot from the condenser through D and the resonator fitted to the spark plugs, thereby producing the above mentioned discharge.

No. 1,051,642—James E. Seeley, Los Angeles, Cal. Granted January 28, 1913; filed April 29, 1907.

Pneumatic Tire—Consisting of a single tube designed to be inflated.

The tire, Fig. 5, is of resilient material and formed with a thick portion P opposed to the rim of the wheel and being formed with an inner side I, which is straight in the direction of the width of the tire. I has a port formed in the longitudinal center of the portion P and a main air conduit A, which communicates with the port. A non-return valve of suitable construction serves for the inflation of this tire.

No. 1,051,738—Garrett Kavanagh, St. Johns, New Foundland. Granted January 28, 1913; filed January 29, 1912.

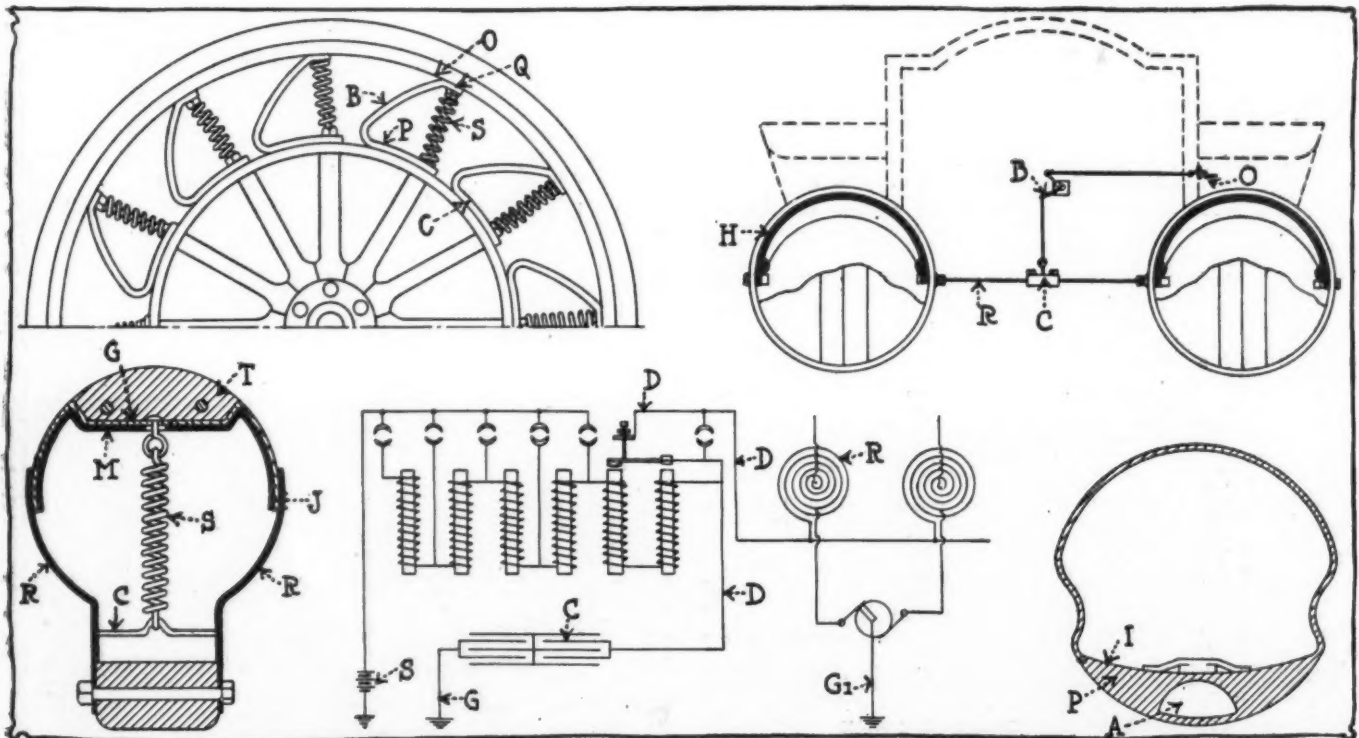


Fig. 1—Messick wheel. Fig. 2—Castleman shade. Fig. 3—Seevers wheel. Fig. 4—Seeley ignition. Fig. 5—Kavanagh tire